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**ORIGINAL COMMUNICATIONS.**

**ART. I.** *Observations on the Modes of warming and ventilating public and other Buildings, with Notes made upon several of these during a recent Journey in England.* By ROBERT RITCHIE, Iron-Founder, &c., to their Majesties, and Engineer, M.S.A.E., &c. High Street, Edinburgh.

THE important subject of warming and ventilating buildings has attracted more than ordinary attention since the publication of the evidence taken by a Select Committee of the House of Commons (Sept. 1835), and the experiments recently made (1836) to improve the ventilation of the building used as the present House. My attention, however, had for many years previously been directed to the subject of warming and ventilating. In the year 1830, on the suggestion of Mr. Robison, Sec. R. S. E., &c., I drew up a report on the state of the heating and ventilation of many of the public buildings of Great Britain, which was read before the Society of Arts for Scotland, upon the 31st of March, and 14th of April, 1830. The Society was subsequently pleased to express its high commendation of the attempt I had made to collect useful information, and awarded me its honorary medal. To obtain correct knowledge of the most approved methods which had at that time been adopted, I personally visited the greater part of the public buildings, hospitals, and churches, in the United Kingdom. Unbiased in my own judgment by any peculiar interest or predilection in favour of any particular process, but ready to approve of heating by steam, hot water, or stove heat, when judiciously applied, and when tried by the test of simplicity in management and salubrity of effect, combined with a thorough ventilation, the result was, that, in 1830, I decided on giving the preference, so far as general purposes are concerned, to heating with the warm air apparatus, modified by Mr. Robison, from the late Mr. Strutt of Derby's original plan. I have tried this process of warming and ventilating buildings most extensively, in almost every part of the kingdom, with great general success.—Amongst other buildings may

be noticed the Royal Colleges of the Physicians' and Surgeons' Hall, Edinburgh; the Orphan Hospital there; the Bridewell there; the Lunatic Asylum there; and numerous churches, seminaries, and mansion houses, throughout Scotland, England, and Ireland.

From what I have seen going on in England, during a tour made in the beginning of the present year (1837), in the modes of heating public and other buildings, I am sorry to observe that I can perceive no decided improvement, based on a sound principle of science, to have been made since 1830. Truth, in fact, compels me to observe that the art of warming by artificial heat, combined with safe ventilation, has, in many cases, within these few years, retrograded rather than advanced. To ascertain the reality of this, we have only to compare the perfect mode of heating and ventilation adopted so far back as 1807, at the Derby Infirmary, under the direction of the late Wm. Strutt, Esq., made public by the late Mr. Sylvester (1819), in his *Philosophy of Domestic Economy*, with the expensive process of heating now lately adopted at the British Museum. Many equally striking examples could be given, to show that, in the proneness in these times to introduce new inventions, or what are often rashly termed improvements, all the established laws of pneumatics are often set aside, and a thorough ventilating process neglected.

The subject of ventilation has, of late, been so ably treated by several authors, as well as thoroughly sifted by the Select Committee of the House of Commons, that we are the more surprised to find the most glaring deviations from known laws continually being practised in London. The necessity of giving the most careful attention to ventilation, for the preservation of health, has been so ably treated by numerous medical writers (among others, by Dr. Arnott, in his *Elements of Physics*, and in the popular work of Dr. Combe, entitled *Principles of Physiology*; and also by Dr. D. B. Reid), that it may well seem superfluous to say one word on the importance of such a subject; yet I do fear, notwithstanding the admitted truth of the principles laid down, and so generally known, as to the intimate connexion between ventilation and health, that either a great negligence prevails, or erroneous views exist, as to carrying out the details. How else can we account for many of the errors in warming and ventilation, which are almost every where to be seen?

Dr. Ure, in this Magazine (p. 161.), has very ably pointed out the defects of one building he examined, viz. the Custom-House of London. If this building were deficiently warmed and ventilated by the great overheating of the external air, what must we say of hundreds of buildings, heated without any provision for

admitting air at all? or when we see the most ample means of allowing what is termed the foul or vitiated air to pass off through the ceiling, and yet not the slightest provision made to admit fresh air, to establish an ascending current, or to change the air of the apartment? To give fresh supplies of heat, without at the same time giving fresh supplies of air, a person, who is aware of the importance of air to health, would think the most preposterous of all absurdities; yet how daily is it to be witnessed, though the least reflection must convince every one who thinks at all on the subject, that a high temperature in apartments may be retained, derived from mere animal exhalation, when the atmosphere is vitiated to the utmost possible degree! Indeed, a comfortable feeling of warmth may exist when fresh air is, for a time, entirely excluded. Hence, the mere giving of heat is no test of a safe process of warming; but is only the more dangerous to health, as the poison deceives as it destroys. Let any one open a small confined cell, containing but a few cubical feet of air (where, if air could find access by a chink, it would be closed by the prisoner within, to retain the heat), and in the morning he will find the air vitiated to such a degree, as almost to deprive him of his senses: and yet the prisoner, on enquiry, will tell you he is warm and comfortable; the vitiation of the air having come on so gradually, that he has hardly perceived it, though he may be overcome with stupor from its effects. No wonder, in such circumstances, disease should be engendered; and that, in ill-ventilated, or, what is nearly the same thing, imperfectly heated, schools, jails, and hospitals, as Dr. Combe states, the result is, an extraordinary degree of mortality, from fevers and other diseases; to which may be added the known prevalence of gangrene in ill-ventilated hospitals.

No error seems more common than the supposition that, if air be admitted by a door or a window into an apartment, the ventilation is complete; forgetting that air, like other fluids, can do no more than fill a given space, as liquid does a bottle; and that it is impracticable to admit fresh air unless means be provided for the escape of that for which it is to be substituted. Therefore, no process of warming and ventilating can be perfect, unless provision be made for establishing a constant and uniform current; or, in other words, the renovation of the mass of air of the apartment. In our ordinary dwelling-houses, the renovation of the air in apartments is simply and salubriously kept up, to a great extent, by our ordinary fireplaces; for, just in proportion as the fire burns brightly, does the rate of circulation increase. Hence, whatever may be said against the waste of fuel by the current of heated air passing up the chimney, and the inequality of temperature produced in an apartment by the radiant heat of the fire; yet, unless apartments could generally be

warmed by the talent of a Strutt, no simpler or more healthy process of heating can be introduced than a well-constructed fireplace, realising the comfort of an Englishman's fireside. But, in almost every case where the real comfort of a dwelling-house of any size is sought after, the ventilation by fire heat should be combined with that of air moderately warmed, in order to prevent the rush of cold air into the apartment to supply the combustion every time the room doors are opened ; and, in truth, to give air to keep up the combustion of the fire. Every well-constructed house ought therefore to be so contrived as to admit a large supply of air, operating nearly at all times, independently of doors and windows ; and, as this air, in winter, should not be admitted cold, it must be previously warmed to a tepid state, so as not to injure its purity and freshness. To this point my attention has been directed for years ; and it has been my aim to construct an apparatus which, while warming a large volume of air to a moderate temperature, should require no more attention in the management than the ordinary run of attendants can be expected to give.

In houses which are not of sufficient magnitude to justify the erection of an apparatus, the nearest approach to the beneficial results arising from one is, to have a communication between every room and the staircase, even when the doors of the room are shut. This may be effected by a horizontal opening [see the section by Mr. Saul in Vol. I. p. 234.] over each door, concealed by its architrave. There should, at the same time, be air-flues in the ceilings of each apartment, for the escape of air, independently of what will be carried up the chimney.

I am justified in expressing strongly my opinion on the necessity of combining ventilation with heating, by observing the method adopted in heating many of the public buildings in London and elsewhere. I may first allude to the British Museum, as it is a building thrown open to the public, and on which so much has been expended. A great part of this building was formerly warmed by air-stoves, which, I believe, were disused from the difficulty which was found to exist, to fall upon any plan to prevent the air bringing in with it the sooty particles with which the London atmosphere is saturated. In consequence of this, the external air was shut off, and the air of the building itself used as the sole heating medium ; the air (as in the Elgin and Egyptian galleries) going down to the hot-water apparatus to be heated, and being returned again to the apartment. This hot-water apparatus consists of cases filled with hot water, among which the air circulates, and is heated. In the Library, the same process goes on, with a different apparatus ; and, in the large galleries now in the process of completion, the hot-water pipes are merely placed in coils upon the floor, without any pro-



vision whatever for admitting fresh air to be heated. How such a process of heating can be possibly adopted in a building devoted to the noble purpose which this is seems inexplicable; instead of improving the process of heating, it is retrograding. If the first was defective from over-heated air, still there was a chance that air sometimes pure should be admitted. At present, the whole air to be heated is admitted from the doors or ceiling; consequently, no uniform current can possibly be established. If indeed, there existed the means of entirely changing the air of the apartments every day, there would then arise less danger from such a mode of heating; which, though it may occasion no inconvenience to the casual visiter, cannot fail to injure the health of all those who daily respire such air; and, so far as my enquiries led me, I am impressed with the conviction, that the daily attendants in the house must soon suffer in health from living in such an atmosphere. I was very much struck with the force of this when I examined the Print Room. In 1831, Mr. Smith (whom I knew), who had charge of the prints, was very full of a new method of heating with hot water, as the room, though lofty in the ceiling, has no fireplace or current of air through it (the lights being from the ceiling). I took the liberty of suggesting the necessity of combining the heating process (which consisted of large cases filled with hot water, standing on the floor, and heating the air of the apartment) with a thorough ventilation. In April, 1837, I found Mr. Smith had been dead some years, and his successor also was dead. The present gentleman in charge I did not see: but, if danger existed before, greater does now, as the old hot-water apparatus has been removed, and a new coil of pipes, at a much higher temperature, substituted. When the new coil of pipes was placed, a skylight above appears to have been opened; but no means have been established for creating a current of air; unless an opening, of most inadequate dimensions, be intended for that purpose, which, as it may serve more to annoy than to ventilate, will probably very rarely be used.

In the present Library, the confined stagnant state of the atmosphere is severely felt, from the circumstance of there being no thoroughfare through the gallery, to change the air admitted by the door at one end of the long apartment.

I may here notice another instance, of still more recent date, where the laws of physical science seem to have been equally neglected, and where the evil effects may be much more serious than in the former case: I allude to the City of London School, Milk Street, Cheapside. This elegant building has been erected for the education of 500 boys, sons of freemen of London, where an excellent system of education is introduced. I wish I could say as much for the method of warming and ven-

tilating; but, though I found the class-rooms amply supplied with hot-water pipes, at the highest temperature to which the furnace-man could raise them (with fuel heaped on, like a fireman feeding his engine boiler), there was not a breath of air admitted to these class-rooms, but what came in by the chinks of the doors, or by the windows when opened. Dr. Combe has so pointedly alluded to the danger of ventilating highly heated apartments, filled with people, by opening windows, that I need hardly allude to the absurdity of such a method being the only one provided for changing the air of the room. Though I visited the school early in the day, when the air must be supposed to be in its freshest state, yet I was quite sensible of the want of circulation, and the consequent vitiation of the atmosphere. When the injurious effects of breathing long an impure and stagnant, but highly rarefied, atmosphere are considered, the danger to youth of such a mode of heating must be strikingly manifest, as well as its probable effect on the health of the masters of the institution. When such a defective mode of heating and ventilating is contrasted with what was done in the wards of the Derby Infirmary more than twenty years ago, we may almost doubt the very evidence of our own senses.

But it is not only in this instance that the same absurdity is manifest: churches, colleges, schools, hospitals, museums, dwelling-houses, and hot-houses are all indiscriminately heated by the same process, without once taking into consideration, that what may be very useful in one case, may be extremely injurious to health in another.

In numbers of churches which I have examined, not only in London, but in Liverpool, Manchester, and various towns in the north of England, I have found them heated by pipes filled with hot water at a high temperature, without the slightest provision (except in one case, at Liverpool) for admitting any fresh air whatever. When the fact is known, that 1000 persons (which is only a moderate congregation) will destroy 300,000 cubical inches of air per minute, or, in other words, that each person vitiates 300 cubic inches per minute; and, according to Professor Faraday's evidence, that a man ought to be supplied with from ten to twenty times the quantity of air vitiated by him, to keep the atmosphere he breathes in a pure condition; one may easily surmise the great quantity of atmospheric air at a low temperature requisite to be admitted to keep up a healthy ventilation, without the necessity of keeping up the temperature by exhalations from the living body. In one of the chapels I examined at Liverpool, I found it heated by but four small gas stoves, drawing the air from the chapel. It is easy to imagine the injury done to the atmosphere by this mode of heating, when one gas burner will produce more carbonic acid than six or eight candles. There is no place where deficiency of ventilation

and imperfect heating are more manifest than in a church, particularly during the afternoon service; when, in most churches, the air is found to be languid and heavy, inducing drowsiness, headach, and often, in delicate persons, faintness; all which symptoms arise from the corrupted state of the air; the deficiency of the temperature having induced the door-keepers to close the doors when the first service was over, to retain the heat, and they being quite unaware that they were retaining with it the impure atmosphere produced by the respiration of the people in the morning. It is true that, in many of the churches which I examined, I found large apertures in the ceiling, said to be intended for letting off the heat; and, when the church doors are open, doubtless there will be forced upwards a portion of the impure air in the church: but these apertures cannot be effective unless there is at all times, while the process of heating is going forward, an ample supply of air admitted below.

It is evident, from what has been stated, that any mode of heating a building, such as a church, filled with people, without access of fresh air, as well as fresh supplies of heat, must be injurious. The greater the heat, the greater will be the evil; and, so far as the mere principle of heating is concerned, it might be effected more safely with hot-house flues than with highly heated iron pipes; inasmuch as the radiant heat of the former would be less liable to scorch the animal and vegetable matter floating in the air, and coming in contact with a highly heated surface, and producing disagreeable effluvia. The convenient form of these iron pipes, however, gives them an advantage in practice, and induces those requiring them to put up with some inconveniences in their application. Where a building is not occupied by people, and where mere heat is required, without a renovation of the mass of air, such a form of heating may be useful.

It appears to me that the combination of ventilation with heating has never been half appreciated in mills and manufactories. In all those that I have examined, the mode of admitting the cold air is defective, it being principally by the window; while the high temperature kept up by the steam-pipe passing through the different floors makes the want of a steady current of air entering more sensibly felt. There exist so very many obvious reasons for heating cotton mills by the present mode of steam pipes, that it does not appear likely to undergo any material change; but, as Dr. Ure has so highly praised the system of ventilation generally adopted in them, I can only say, having had an eye on these matters, since Mr. Buchanan, in 1815, published an account of Snodgrass's *First Process of heating Mills by Steam*, I have observed very little decided improvement in their ventilation; and, though I am willing to subscribe to a good deal of what Dr. Ure states in praise of the introduction of the ventilating fan,

yet, until there is combined with the drawing off the air from the house by the fan, a proper plan for supplying each floor with air to be heated, and then drawn off, the ventilation cannot, in manufactories, be viewed as perfect, or, though improved, held out as complete.

I was much gratified to find Mr. Strutt's mode of warming and ventilating had been introduced by that gentleman, with great success, in both his green-house and his vinery at Derby. This point is well deserving of the attention of the horticulturist. The gardener of the present proprietor, Edward Strutt, Esq., M.P., informed me that nothing could work better than this system : he preferred it either to the heat of brick flues or iron hot-water pipes, both of which he had tried ; but he could raise better grapes, and keep his plants in finer condition, with the warm-air apparatus than either. He avoided every risk of scorching, by sprinkling water frequently and plentifully on the cover of the air-flues, to produce a gentle evaporation, keeping the inner surface of the glass in a constantly dewy state ; by which an excellent climate was produced. Indeed, we could not but be sensible of the freshness and perfect freedom of respiration experienced in these houses, as distinguishable from the confined stagnant air to be found in houses heated with flues or water-pipes ; and, when it is considered that the object of having a high temperature is to approach the heat of the south, where the thermometer indicates a high degree, with ample presence of fresh air, this method of heating must at once appear to approach much nearer to nature than any of the other forms of heating which have been so long popular. It does, however, require attention ; but, I was informed, not more than other modes ; while the heat can easily be retained during night. The construction of the apparatus is, however, the most important point to be attended to, in order to prevent any risk from the sudden rising and overheating of the air.

I have already alluded to the admirable plan of warming and ventilating introduced by the late Mr. Strutt in the Derby Infirmary, and in his own house near that town, a plan which has stood the test of thirty years of experience with undiminished success. The Derby Infirmary, in the year 1837, as it was in 1807, may fairly be viewed as a masterpiece in domestic economy. Here every thing really useful in contrivances for domestic comfort has been brought into daily operation. Steam performs its silent work, and is applied to purposes which task human ingenuity, and are yet unrivalled in simplicity ; and here may be seen the operation of the most profound knowledge of natural philosophy, applied to the purposes of practical utility. The general arrangements for the ventilation and warming of the house evince a thorough knowledge of that very principle of

the change or renovation of the air upon which so much has recently been said before the Select Committee of the Commons; and the wards are as free from the least taint as the most wholesome apartment; while the total absence in this infirmary of gangrene and erysipelas is a manifest proof of the perfect ventilation kept in every part. Let any medical man contrast the atmosphere of this house with, for example, that of Manchester; and what must be his opinion of the difference? At Derby, either in winter or summer, by night or by day, the same perfectly operating system of ventilation goes on: the air of every ward of the house is in a constant process of change. In winter, the warmed current of air flows in, and as certainly flows out, carrying upwards with it every noxious exhalation. In summer, the air is cooled easily without a freezing mixture; and, by the happy availment of simple atmospheric pressure, aided at all times by the prevalent wind, it is nearly impossible that the ventilation can be impeded; and, even in calm weather, if there is a breath of air, it must be conveyed through the wards.

Justly praising, as I do, this well-arranged system of ventilation, I am most unwilling to contrast it with other modes now adopted, though I fear they would lose much by the comparison; not because the greatest attention has not been paid to the very point here alluded to, but because, often, in seeking after too much, simplicity is overlooked, and pneumatic principles confounded. I may be permitted, however, in perfect fairness, to contrast the principle of ventilation adopted at the Derby Hospital with the experiment which has just been made to improve the ventilation of the House of Commons. While I do this, however, I cannot but subscribe my meed of praise to the gentleman under whose direction and advice these experiments have been made, viz. Dr. D. B. Reid, who, in his evidence, as well as in the highly interesting printed *Remarks* he has published, has laid down principles as to general ventilation that cannot be controverted, based, as they are, upon reason and science. Though far from being for the first time brought before the public, he deserves thanks from the community for bringing them so prominently forward. On the idea of giving the means of a constant change or renovation of the air, more than twenty years ago this principle was carried into operation, and made public, by Mr. Strutt. A hundred inventions have since been made; yet so slow is the progress of sound philosophy, compared with the empiric puffing of trading patentees, that plans and principles that might be adopted by all are laid aside for the speculative contrivances of the day. No better an illustration of this can be given, than the fact that, in the town and neighbourhood of Derby itself, instead of the excellent in-

ventions of Mr. Strutt being in general use, there may be found both churches and other public buildings heated without any admission of air whatever. Though the principle of Dr. Reid is not new, the details are; and these I shall shortly consider. Dr. Reid's plan is now carried into effect: the external air is admitted very amply; the provision for warming it seems abundant, and the general arrangement good. The first point that seems new (though I have seen it elsewhere) is the perforation of the floor with three eighths of an inch openings, the whole being covered with hair-cloth. This seems to me an improper mode of admitting either cold or warm air; as the strength of the entering current is not only completely impeded, and almost rendered nugatory, by the hair-cloth, but this hair-cloth must speedily be impregnated with dust from so many feet passing over it; and, if there is any current at all, the dust must pass upward every time it is touched, and enter the tracheæ of the honourable members. If there is no current to do this, then the principle is destroyed, as the entering air will not have sufficient force to remove the heated air above. But, it appears to me that the current can never be very strong, from the manner in which the force of the air is broken and dissipated, while it wants all the power of the current established by the flue at Derby, to catch every breeze, from whatever point it blows. The warm air passes off from the ceiling by corresponding perforations to those below, and is collected in a horizontal chamber, whence it descends by a vertical shaft to the furnace placed at the bottom of the air-shaft, which is built like the chimney of an engine, 100 ft. high. The grating is placed a few feet from the bottom of the shaft, and is above 9 ft. in diameter; the shaft being 11 ft. inside diameter at the base. The grating at the bottom of the air-shaft will contain from 8 cwt. to 20 cwt. of coke, which is used as the fuel; and a plentiful fire is kept up, for the purpose of drawing down the foul air collected at the ceiling by the vertical shaft, and passing it up the air-shaft at a high temperature.

From this, it will be at once perceived that the whole ventilating process is entirely artificial, and that just in proportion as the fire in the air-shaft is kept up, so the current will be increased, and the foul air extracted. In truth, by this arrangement every member in the House is entirely dependent for ventilation on the person in charge of the furnace; and the members would do well to have an officer appointed to see that he does his duty; for, should the fire get languid, as coke is burned as fuel, the heavy air might regurgitate up the vertical shaft; or, if this did not happen, the foul air in the collecting ventilator above would remain suspended, as it could have no natural bias to descend the shaft, unless drawn down; and there



are no means by which it can escape to the outer air from the ceiling. So that, if this ventilating process be contrasted with that practised at Derby, we shall find that there, without the least artificial means of keeping up a fire, the foul air from a dozen apartments passes continually and steadily off, without the least chance of regurgitation. The very ingenious and, no doubt, well considered process of Dr. Reid seems too complicated, and much too expensive, to come into general use. In the House of Commons, by the careful working of the details, it may be found to give satisfaction; but I should be afraid to leave the details entirely to the charge of ordinary attendants. No process of ventilation can be, indeed, deemed perfect, that is not arranged to go on, in a great measure, independently of attention: at all events, the ventilating apparatus should be under the control of those who are subjected to breathe the air ventilated. Dr. Ure, in his recent paper (p. 161.), observes that, "in ventilating crowded apartments, such as the Houses of Parliament, instead of having recourse to chimney draughts, as has been hitherto the invariable practice, and which operates by pumping out, exhausting, or attenuating the air, we ought, on every principle of sound physiology, rather to increase the density and spring of the atmosphere, by throwing in a continual current of pure air, brought to a proper degree of temperature and moisture in a chamber of preparation." From these remarks, it would appear that Dr. Ure disapproves of the method Dr. Reid has adopted of drawing off the air of the house by a chimney draught.

I cannot subscribe to the opinion which Dr. Ure has so strongly given against the method of heating the Custom-House. From the examinations I made of it, it seems to me that several of the evils he attributes to highly heated air entering the house, arise from the defective state of the furnaces themselves; which having given way also, the carbonic acid gas from the fuel escapes into the house, along with the current of air heated. This at once accounts for the unwholesome effects he perceived, without the supposition that the warm air, which is the external air heated, could produce such serious evils. There is no doubt, from the construction of the heating apparatus, that the warm air must get to a temperature much too high for salubrious effect; still, as there is a large supply of atmospheric air provided to be heated, I cannot suppose it possible that any very serious evil could result, unless from the cause I have stated, of the carbon of the fuel escaping into the warm-air chamber. This effect is still palpably manifest in the Examiner's Room; and, if this is fact, it at once destroys much of the argument of Dr. Ure against air being heated by passing over iron surfaces. Dr. Ure alludes particularly to the danger of stoves overheating the air;

but the very ingenious invention of Dr. Arnott of Bedford Square must satisfy any one that the air can be heated by passing over a metallic surface heated by fuel, as safely and as purely as when either heated by steam or hot water. Dr. Ure has dwelt forcibly on the advantages to be derived from the use of fanners; but another ingenious contrivance, on the same principle, is now in the process of erection at the Bank of England, under the direction of their engineer, Mr. Oldham, formerly of Dublin, who introduced the same method of heating at the Bank of Ireland. The plan consists in forcing the air, by an air-pump worked by the steam-engine, through the interstices of iron cases filled with steam. The external air is introduced at one end of a conduit (not above a foot square); and, after passing through the heating process, enters a vertical tube, and is blown off right and left into cases for drying the bank notes. At present, the experiment is confined merely to mechanical purposes; but I believe it is intended, if it succeeds, to apply it to the heating and ventilating of the rooms. The Directors' Room, at the Bank of England, is heated by a large mass of coils of hot-water pipe; but the closeness has proved so excessive, combined with the heat, that the use of it has been entirely given up, and it is intended to remove it, and to leave the heating entirely to the open fires.

The very large room of the Bank, in which so many clerks sit, seems very highly heated, by the heat radiating from so many persons. The only fire heat in the room arises from a few open fireplaces, without which the want of ventilation would be dreadful: as it is, the clerks are under the necessity, from the defective ventilation, of reinhaling the vapours emitted by the lungs of themselves and their neighbours.

To carry out the views recommended in this paper, it has been my object, for years, to construct an apparatus with such an extent of heating surface as, while it produces the effect of warming in large volumes the atmospheric air to a tepid and genial heat, should be simple in management, not liable to be put out of order, and applicable, not merely to one particular building, but generally to all.

As there are so many inventions for heating buildings constantly brought forward, and so much weight is always put on the invention itself, generally rendered more important by means of a patent, without the least consideration that a really good invention may be rendered utterly useless, if not sometimes injurious, when improperly applied; and as the numerous contrivances introduced are no sooner brought forward than laid aside for some other invention; I think I cannot conclude this paper better than by giving the opinion of a gentleman who has paid much attention to the subject of warming and ventilating, and

who has had ample opportunities of becoming acquainted with most modern inventions, and with their practical bearing.

*Letter from John Robison, Esq., Secretary to the Royal Society of Edinburgh.*

10th April, 1837.

SIR, In reply to your enquiry as to my opinion of the relative advantages of the different forms of apparatus for warming domestic and public buildings, I beg to say, generally, that I hold that apparatus to be the best, which, by affording a large supply of air at a very moderate temperature, gives the means of constant change and renovation of the mass required to fill the space which is to be heated.

Almost all the insalubrious and disagreeable effects experienced from the use of stoves arise from the heating surfaces being too small, and at too high a temperature; hence, in all those forms of apparatus where a small supply of air at a high temperature is employed to heat a building by being mixed with the colder air admitted by other sources, these evils are experienced in a greater or less degree according to circumstances. If the heating surface be of metal, and very hot, the passing air is partially vitiated by the oxidation of the metal; and disagreeable effluvia are extricated from the particles of animal and vegetable matter which are always floating in the atmosphere. This latter effect is sensibly felt, even at the comparatively low temperature of water boiled under high pressure, as in Perkins's system of small pipes; which, however, is far less objectionable than many others of the forms of apparatus at present in use.

Where the first cost, the large space required, and the expense of management, would not be considered insuperable objections to its adoption, I have no doubt that a largely developed apparatus of pipes, heated by steam of *atmospheric pressure*, would be the most salubrious and agreeable; but the objections, both of an economical and of a practical nature, are so great, that there are few situations in which it can be introduced with propriety. The system of heating by the circulation of warm water (at atmospheric pressure) is liable to many objections in execution, except in the single case of hot-houses, where mere warmth, without much change of air, is all that is required.

On the whole, I do not think that any of the systems now before the public combines so many advantages as the modification of the stove of the late Mr. Strutt of Derby, of which you have yourself had so much experience; as it, when sufficiently developed, and when its cold and warm air flues are properly executed, is the most effective of any with which I am acquainted, in furnishing a *large volume of slightly warmed* air; and in this way is the most salubrious; as, while by its means the proper tem-

perature can be given to a building, a continuous change and renewal of the air may be attained.

The experience I have had of stoves on this construction in two houses I have been dwelling in, during the last fifteen years, has not led to any alteration in the plan, except in diminishing the size of the fireplace; and in one which I am about to order for a new house I am now building for myself, although I shall considerably increase the quantity of surface (to adapt it to the larger space), I shall make no other change, being perfectly satisfied that I can get nothing more efficient in the result, or of easier management by ordinary servants.

When circumstances admit of sufficient developement being given to the stove and the air-flues to furnish a large volume of air, its temperature, *as it issues* from the stove, should not be above blood-heat: and it will then not be too greedy of moisture.

I am, &c.,

Mr. Ritchie, High Street.

JOHN ROBISON.

[WE shall be much obliged to Mr. Robison, or to Mr. Ritchie, if either of them will supply us with plans, sections, and all the necessary details and instructions, for carrying the last improvements on the Derby stove, made by Mr. Robison, into execution. Having had our own house heated by a Derby stove, put up under the direction of the late Mr. Sylvester, we certainly have considerable objections to it in a small house; and we are therefore not only particularly anxious to see how far Mr. Robison has removed these objections; but to be able to form an estimate of the merits of the improved apparatus, as compared with one for heating the atmospheric air before it enters the house, between numerous thin plates of hot water. This mode has been carried into execution in several houses in London by Mr. Manby; and we hope soon to be able to give an account of it in this Magazine. — *Cond.*]

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## ART. II. *Candidus's Note-Book.*

### Fasciculus VII.

"Sicut meus est mos,

Nescio quid meditans nugarum; et totus in illis."

I. THE exhibition of Etruscan tombs, now open in Pall Mall, is exceedingly well worth visiting, not only for its extreme curiousness, and that of the objects it contains (to say nothing of the singular contrast they offer to the bustling world without doors), but also for the many hints to be derived from it, especially in regard to planning and fitting up a suite of small and

low cabinets for articles of virtù, books, &c., within a space too low and narrow to admit of any other kind of architectural pretension or display. The chief drawback is, that these fac-simile representations of the original tombs, which contain, however, many of the works of art discovered in the tombs themselves, may be seen without the least trouble; and, of course, their *come-at-ableness* detracts astonishingly from the interest and wonder they would excite, had we to travel a thousand or two miles to behold them. Distance is a great magnifier of the wonderful. Even a lion, in a menagerie, hardly looks like a real lion; and I am inclined to believe that, could the Parthenon be removed to London, the chief wonder it would excite would be, that travellers should have found any thing extraordinary in it at all. If such were not in some degree the case, no doubt some one would have thought, ere this, of getting up some kind of exhibition, to show one of the houses of Pompeii, both in its present state, and as restored to its original condition, with all the articles of furniture for which any authority is to be found. Something of the kind might, without much difficulty or expense, be attached to the grounds of the Coliseum in the Regent's Park; since, as all may learn from the exhibition of the Etruscan tombs, a mere framing, consisting of thin double partitions, instead of solid walls, would answer the purpose; and papering and painting would do nearly all the rest. For a Vauxhall, again, a series of open cabinets, decorated *à la Pompeii*, would be far more in character with such a place of amusement, than the ugly dingy holes now termed "boxes."

II. No better situation, I conceive, offers itself for the Wellington statue about to be executed by Chantrey, than the summit of the arch leading into the Green Park, which was originally intended to be surmounted by some decoration of the kind. Were there nothing else in its favour, economy would certainly decide for its being placed there, since all expense for a suitable pedestal and its foundation would be obviated, and the whole of the funds would go towards the statue alone, which might, therefore, be upon a rather grander scale than could otherwise be afforded. As regards locality, to say nothing of the vicinity to Apsley House, this would be preferable to any of the other sites proposed; for on that spot the statue would prove a very effective ornament to one of the principal entrances into the metropolis. Besides which, entering into combination with the arch, it would form a much more imposing object (of a kind, too, of which we have as yet no example), than if merely placed upon a pedestal; while, on the other hand, the arch itself would acquire additional dignity and importance. Perhaps, it will be objected, that, so placed, the statue would look too much like a mere ornamental accessory to the arch; not, as it ought

to be, sufficiently conspicuous of itself. That, however, would depend entirely upon its relative magnitude: a figure, not much larger than life, would, of course, appear insignificant, or, at least, too secondary. It would require to be of such dimensions as would impart to it both consequence and effect. I should apprehend that one about the size of the statue of the Duke of York, on the column in Carlton Place, would appear a very noble object, if placed at no greater a height than the summit of the gateway alluded to. Whether, if so placed, the statue would suffer by comparison with the bronze one nearly opposite in Hyde Park, is a point for consideration; for it certainly ought not to appear small by contrast with the latter. The chief objection would be that raised by the majority of the subscribers; who would, doubtless, insist upon their Wellington statue being placed somewhere in the city: for on such matters people are apt to be not a little pig-headed, and to stand up most pertinaciously for what they consider the interest and dignity of "our own parish."

III. If there be any species of embellishment in particular to which the Italian style can lay claim, and in which it has displayed much and considerably varied effect, it is in rusticated work. Although the name given to it is not intended to convey any such idea, it is susceptible of being rendered not a little decorative, as well as expressive of strength. Yet at present it seems to have fallen into nearly total disuse among us; for, if any mode at all of rustication be now employed, it is that of the French school, which consists only of horizontal stripes; the effect of which is as poor and unmeaning as it is monotonous. Of this last-mentioned species an offensively striking specimen is furnished by the Goldsmiths' Hall, where not only does it contribute nothing towards the expression of strength and massiveness, but is positively at variance with all the rest of the design; which, together with the richness, has also the heaviness, of the modern Roman school. On the other hand, the back front of the Travellers' Club-house is a happy example of what may be accomplished in the way of ornamental finish, by rustics and rusticated surfaces. They are also applied with a singularly pleasing and almost delicate effect in the stone piers of the railing before the College of Surgeons, where the rustication forms a kind of tablet, or raised face, tooled, and slightly projecting beyond the plain border which surrounds it. Such tooled surface, it should be observed, is altogether different from that coarser hatched work usually employed for bossages or "rough rustics." Rusticating in various ways, in the different stories, might occasionally be resorted to very advantageously for an entire front, and would admit of great diversity, and numerous combinations.



IV. It is almost next to inexplicable that so very little should have been done towards making us acquainted with the interiors of buildings, either in foreign countries or our own. Let us open any work professing to display the principal structures of Paris, or any other city, and, most likely, out of a hundred subjects, we shall meet with barely half a dozen interior views; and even these will be nearly all of one class, namely, churches; as if there was neither novelty nor interest in any other places. What renders this all the more provoking, as well as unaccountable, is, that not only does the draughtsman thus pass by subjects that would be perfectly fresh in themselves, and which are frequently far more deserving of being represented than those which are usually given, but he passes by such as are comparatively little known; because it does not often happen that even tourists visit the inside of a building more than once, and then generally very hurriedly, considering how very much more there is to be examined than in a mere *façade*, which is no more than the side of a single room; that is, it consists, like the latter, of only a single elevation. Most assuredly, it cannot be urged that the descriptions which tourists and travellers give us of the interiors of buildings are so very copious and exact as to render drawings of the same kind almost superfluous; because it so happens that they too are no less shy than draughtsmen of touching upon such matters. It may be questioned whether, exclusively of churches, one could collect fifty tolerably distinct descriptions of the kind alluded to out of the works of as many travellers. I am willing, however, to make some exception in favour of Mrs. Jameson, who, I cannot say fully *describes*, but notices at much length the interior of the new Palace, Glyptotheca, &c., at Munich; and with so much enthusiasm in her commendation of their splendour, that it is astonishing Mr. Gwilt has not taken her to task for it, and read her a lecture upon her bad taste, advising her, as well as the critic in the *Foreign Quarterly Review*, to keep her remarks in future to her own private circle. Even in our own metropolis, how many rich architectural subjects for the pencil are there, from some of which the public are excluded altogether, nor have other means of becoming acquainted with them except by the assistance of the pencil; while others, although accessible to many individuals, are yet quite shut up from the rest of the public, whether residents in the metropolis or not. To the former of these two classes belong the vestibules, staircases, galleries, libraries, saloons, &c., in such mansions as that of the Duke of Sutherland; to the other, the apartments in Goldsmiths' and other city halls, and in the various club-houses, and similar places. There are many highly scenic parts in the interior of the Bank, yet scarcely one has ever been made the subject of an engraving; at least,

has ever been satisfactorily represented. The same remark applies more forcibly still to the chapel at Greenwich Hospital; for, notwithstanding that it is a perfect *bijou* in its way, and quite unique for this country, I am unable to learn that it has ever been delineated at all, although we have views of the interiors of ugly churches, hashed up and set before us again and again, in all their insipidity; and we ought, perhaps, to be thankful if there be not detestable ugliness likewise. Nor have we only to complain that, for the most part, the subjects themselves are taken at random, and, even when they happen to be good in themselves, are rarely made so much of as they might be; for, instead of confining the view to the most effective part, and exhibiting that fully made out in all its details, the chief object appears to be to get rid of detail altogether, and show a formal general view of the whole. Take, for instance, the Roman Catholic Chapel, Moorfields: a view straightforward towards the altar, from the further end, is certainly not the way to set off to advantage the altar-recess itself, with the painting beyond it seen through the screen of columns; whereas a near and somewhat oblique view would render the representation far more scenic and more interesting.

V. A very fair experiment might be made of polychromy, by representing on the drop-scene at one of our larger theatres the portico of a Doric or Ionic temple so embellished, and shown as large as the space would admit of. We should then be enabled to judge of the effect of external architecture, enriched with colours, much more satisfactorily than either from piecemeal specimens of it, or in drawings of the usual size. Whatever might be thought of such an application of colours to actual buildings as a piece of scenic decoration (not an occasional one, but in constant use), it would certainly be exceedingly appropriate for a theatre, and would serve to complete the ornamental appearance of the house. It would, besides, be a very effectual method of bringing more into public notice a peculiarity belonging to genuine Grecian architecture, with which persons in general are quite unacquainted. Let the manager of Covent Garden or Drury Lane bethink of this against another season; for, at all events, a scene of this kind would have the recommendation of being something perfectly novel.

VI. Hardly would it be amiss, or particularly superfluous, were the Institute to establish one or two annual prizes, if in themselves little more than honorary ones, for designs and studies; not of the description usually proposed by academies, not for random *ad libitum* palaces, senate-houses, &c., of which class of buildings not one is erected in a century, and never on the scale contemplated in such visionary projects, but for things of a more practicable and familiar kind, such, in fact, as are wanted every day. For want of exercise in such matters, the

profession are pretty much in the condition of people without any other circulating medium than 50*l.* notes and upwards; agreeable enough to possess, but not very convenient to go to market with every day. For a hundred persons who can draw off hand magnificent, but not particularly original, porticoes, and other ready cut and dry classicalities, there is hardly one who can display any felicity of invention, or produce a tasteful composition on a moderate scale, that shall be strikingly effective, and beautifully finished throughout; although columns be entirely proscribed, and the other features be not of the most favourable kind. Were premiums offered for original compositions of detail and ornament, they would tend (at least, it may reasonably be presumed they would) to encourage more careful study in regard to such matters; and, if these are either beneath the notice, or above the comprehension, of architects, the profession ought rather to be thankful, than to complain that another class of persons, styling themselves decorators, are kind enough to come forward, and take the trouble off their hands in respect to the embellishment of the interior of their buildings; nor would it be any great harm were they to leave the exterior also to undergo similar treatment. By way of condemning the *façade* of the Berlin Museum, Gwilt says that it is more like the composition of a scene-painter than of an architect. Very probably it is so, because it is highly scenic, a quality which it is altogether impossible to detect in the works of many architects who might be named, and to which a scene-painter of any taste would never have recourse.

VII. I will here fling to the reader an idea, which he may adopt or not, as he chooses; namely, for getting small, but very accommodating, closets out of the *antæ* of a sideboard recess in a dining-room, the *antæ* themselves being hollow, and the inner faces towards the recess hinged and made to open like doors, without exhibiting any indication of being such. Of course, such a contrivance would be entirely thrown away where all occasion for having any kind of closet in the dining-room is superseded by the convenience being provided for elsewhere, and if its being immediately at hand would not be considered as an additional advantage.

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ART. III. *Notice of an Action brought by a Surveyor to recover his Charge for making certain Calculations.* Communicated by M. J. B. ASH.

(In the Common Pleas, November 30. 1836. Before Lord Chief Justice TINDAL. *Moon v. The Guardians of the Witney Union.*)

MR. SERGEANT WILDE and Mr. Harrison were counsel for the plaintiff, and Mr. Serg. Talfourd and Mr. Chilton for the defendants.

This was an action brought by the plaintiff, who is a surveyor, to recover 65*l.* for making certain calculations. It appears the Board of Guardians had determined to build a new workhouse; and, as the union was extensive, a considerable establishment was required. The estimated expense was about 6000*l.* Mr. S. Kempthorne, an eminent architect, was employed; and the plan having been decided upon by the guardians, Mr. Kempthorne appointed Mr. Moon, the plaintiff, to make out an account of the quantities for the use of the builders; and Mr. Moon furnished the calculations required. The plans were then considered by the guardians to require some alterations; and, those alterations having been made, it became necessary to alter the account of quantities. The charge made by the plaintiff for the first account was 40*l.*, and for the subsequent account 25*l.*, amounting together to the sum claimed. Mr. Kempthorne had received 86*l.* by way of compromise upon a larger claim; but no contract was entered into, and the business was subsequently taken out of Mr. Kempthorne's hands.

On behalf of the plaintiff, several architects and surveyors were called to prove that a general usage had prevailed in the profession, for ten years, that a surveyor, and not an architect, should make out the account of quantities for the builders; and that the architect was authorised to employ a surveyor without consulting his own employer.

Mr. Sergeant Talfourd contended that the defendants incurred no legal liability, and objected to the evidence of usage.

The Chief Justice thought that the legal liability was a very proper question to be raised: they, probably, did not feel themselves at liberty to pay the sum in question without some discussion upon the subject.

Mr. Sergeant Talford having understood that he had leave to enter a nonsuit upon the legal points, then addressed the jury with respect to the evidence of usage.

The Chief Justice summed up, and left it to the jury to say whether any such general usage was established, giving the architect authority to appoint a surveyor without consulting the principal employer; that the plaintiff might, upon reasonable enquiry, have become acquainted with it.

The jury retired, and returned a verdict for the plaintiff, damages 65*l.*, subject to a motion for a nonsuit.

*Hilary Term, 1837.*—Mr. Sergeant Talfourd moved for, and obtained, a rule to show cause against the verdict, on the grounds that there was no privity of contract between the plaintiff and defendants, and that the evidence of alleged usage was not sufficient to sustain the action.

*Trinity Term, 1837.*—The case was argued before the Judges. Decision,—That there was enough to show that the ar-

chitect had in this case an implied authority, as agent for the defendants, to employ the plaintiff; therefore they confirmed the verdict for the plaintiff.

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## REVIEWS.

ART. I. *Elements of Architectural Criticism, for the Use of Students, Amateurs, and Reviewers.* By Joseph Gwilt, Author of a Translation of Vitruvius, &c. Royal 8vo, pp. 98. London.

WE hardly know how to enter on the review of this work, it being, taking it altogether, in our opinion, discreditable to its author. In what we say of it, however, we shall bear in mind a principle, which we hope we always act on: viz., that every action of man ought to be guided by a benevolent feeling; and that the grand object in writing a review, like that of all other human actions, ought to be to do good; not merely to the proprietors of the review, but to mankind at large. The present state of human nature is indeed such, that a clever review, dictated by malevolent feeling, will generally succeed better in selling the book in which it appears, than one of a contrary description; but, by doing good, we mean pointing out the errors of the work reviewed in such a manner as to lead to the diffusion of more correct principles, and, at the same time, not to give any personal offence to the author of the work, at least if he be a reasonable man. From this fundamental principle of reviewing, we have derived a rule which we think convenient for daily use; and that is, to suppose that we are personally acquainted with the author, and are consequently unwilling to hurt his feelings. In this spirit, then, we make the following remarks.

From the title of this book, we expected that it would be entirely, or at least chiefly, occupied with elementary principles of architectural criticism; instead of which there are only three or four pages that can have the slightest pretension to be entitled elementary principles, and these are contained in Sect. I. On the Laws of Proportion. The rest of the work may be described as remarks on certain articles which have appeared in the *Foreign Quarterly Review*. There remarks are contained under the heads of, Sect. II. Grecian Architecture; Sect. III. Italian School of Architecture; and Sect. IV. German Architecture: in which the object seems to be to attack what the writer in the *Foreign Quarterly* has said under each of these heads.

In Sect. I., entitled Laws of Proportion, the author has quoted Lebrun's theory, in which stability is made the fundamental principle of proportion; and in which the rules for the

general proportions of the different orders are derived from the adjustment of the support to the load. This we conceive to be the only valuable part of the book, of which it occupies between four and five pages. The subject, the author tells us in the following passage, was first noticed in his edition of Chambers's *Civil Architecture*. We quote this passage entire, because we think it proves two points: in the first place, that the author cannot adopt a simple and clear style of writing, or, if he can, does not think it worth his while; and in the second, that he does not understand the subject of fundamental principles. Who that did, would speak of some qualities affecting the eye, in contradistinction to others which affect the understanding and the affections?

"But I wander from the subject, and it is now time to turn to one of the more immediate objects of these pages, namely, the introduction to the reader of the theory laid down by Lebrun. This was first noticed in my edition of Chambers's *Civil Architecture*, in 1825, but seems nevertheless to have attracted so little attention in this country, as to be scarcely seen in a catalogue of books, though on the Continent it has met with a very different reception. If it can be shown that those buildings of antiquity which are universally accounted beautiful, exhibit a certain constancy in their proportions of weight and loading, it seems but a fair inference that their beauty must, at least in a great degree, if not altogether, be the result of those proportions. Perhaps, if the subject were pursued *au fond*, it would be found that on these proportions might depend not only the requisites of magnitude and strength, which, in construction, are the qualities which affect the eye—those of order and harmony, which, in design, are qualities affecting the understanding; but even the requisites of richness and simplicity, which are qualities more especially exciting the affections. Moreover, the principles in question will be found to involve the science of construction, which, to the architect, is what execution is to the painter, without which respectively neither can embody his ideas."

The remarks on the article in the *Foreign Quarterly Review* are not such as to afford any profit in the perusal, (though there are not half a dozen pages in the work in which the word *Foreign Quarterly Review* does not occur,) with the exception of one, in which he justly blames the reviewer for having, in the *Foreign Quarterly Review*, No. 37., unfeelingly "raked up all the bad points of the late Sir John Soane's private character for the purpose of holding it up to the contempt of the public." (p. xiv.) The faults of this work appear more conspicuous, when contrasted with the handsome manner in which it is got up; we allude to the large page, superior paper and type, and handsome binding.

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ART. II. *A Treatise on the Strength of Timber, Cast Iron, Malleable Iron, and other Materials; with Rules for Application in Architecture, Construction of Suspension Bridges, Railways, &c.: with an Appendix on the Power of Locomotive Engines, and the*



*Effect of Inclined Planes and Gradients.* By Peter Barlow, Esq., F.R.S. 8vo, pp. 492. 7 plates. London.

THIS is a new edition of a well-known and valuable treatise, with so many additions and improvements, that it might almost be considered as a new work. The first edition was published in the form of an Essay, in 1817, since which there have been three editions sold; and of the present, the fourth, the author says, "I have thought it right to remodel the whole, and to introduce into it a great variety of matter not found in the original work.

"The arrangement which it has now been thought proper to adopt may be thus stated: the first subject treated of is, the strength of direct cohesion of the fibres of timber, with an account of the experiments of Musschenbroeck, Du Hamel, Emerson, and others; and, lastly, of those made by the author, with a description of the apparatus by which the results were obtained.

"The next division treats of the mechanism of the transverse strain to which timber and other materials are exposed when loaded in any part of their length, and the mechanical action of the fibres to resist this strain. We then investigate theoretically the laws of deflections under all the varieties of position and fixing to which timber and iron are subjected in architectural and other constructions. Having thus examined theoretically the nature of the several strains, and the consequent deflections, we proceed to a detail of various experiments by Buffon, Girard, Beaufoy, &c., on the transverse strength of timber; and, lastly, the original experiments of the author, which laid the foundation of the first edition, and on which is founded the Table of Data adopted in the subsequent part of this division of the work. Another section is employed in the detail of experiments on bent timber, as used in ship-building—on the effect of boiling and steaming timber; experiments by Girard on vertical pressure, and a series of illustrative problems and examples. A short chapter follows on the strength of cement and building materials, as stone, brick, &c., and on the subject of revetment walls.

"The next division treats on the direct strength of cast iron, and its application in the construction of hydrostatic presses; also on the direct strength of copper, brass, yellow metal, &c., from experiments made by Mr. Kingston on the testing machine in His Majesty's dockyard at Woolwich; and others by Messrs. George Rennie, Tredgold, and Duleau.

"The following chapter treats on the transverse strength and deflection of cast-iron beams under a great diversity of forms, principally from a highly interesting and valuable paper by Eaton Hodgkinson, Esq., in volume five of the Manchester Memoirs. We come now to the subject of malleable iron; and as the experiments on this material were principally made on the testing machine in His Majesty's dockyard, Woolwich, it was thought that an accurate drawing and description of this machine would be acceptable to the reader; two new plates have been therefore introduced, illustrating its entire construction and operation.

"A detail of experiments is then given on the strength of direct cohesion of iron bars and bolts, the testing strengths of the different descriptions of iron cables used in the British navy; Mr. Telford's experiments on iron wires; and, lastly, a Table by Davis Gilbert, Esq., for the calculation of the several particulars connected with the construction of suspension bridges.

"The next subject of investigation is the application of malleable iron to the purposes of railway bars, being the substance of two Reports by the author, addressed to the Directors of the London and Birmingham Railway Company, with the addition of several subsequent experiments on railway bars of various forms and dimensions, and of miscellaneous experiments on

the effect of locomotive engines and trains on the bars of the Liverpool and Manchester line.

"These form the subject of the principal matters treated of in the body of the Work; but an Appendix is added, on the practical action of locomotive engines, and on the effect of inclined planes and gradients, with a view to the comparison of the mechanical advantages and disadvantages of rival lines of railway."

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ART. III. *On the comparative Merits of the various Systems of warming Buildings by Means of Hot Water.* By W. Walker, Pamph. 8vo, pp. 16. Dublin.

MR. WALKER appears to have examined the different modes of heating with care, but, possibly, with a lurking prejudice in his mind in favour of gun-barrel tubes; otherwise we cannot conceive why he should determine in favour of the mode in which these pipes are used.

The first section treats on large metal tubes, which in a dwelling-house are bulky and clumsy; the second on flat tubes, which are better, but which, after long use, are apt to open at the top or bottom, at the welded seam; and the third is on small gun-barrel tubes, which, as we have before said, Mr. Walker prefers. We acknowledge that this is the very last mode that we should adopt; but, notwithstanding this, and though we have seen the apparatus burned in one case, from the non-circulation of the water; torn to pieces in another, from some unknown cause; and burst, in a third case, from the frost; yet still we may be wrong in the conclusions at which we have arrived. The per-centage of the accidents which have occurred in the use of all the different modes of heating should be ascertained, before the relative danger of any of them can be determined on. What if it should turn out that Perkins's is the safest mode after all? It may be so; for, from the per-centage of accidents which happen by railways, we understand they are incomparably safer to travel by, than common roads; and yet, to look at the rapidity with which the carriages move along, one could not come to this conclusion all at once. At all events, as our great wish is, if possible, to act without prejudice, and in every case with a sacred regard to justice, we give the following long quotation, which concludes Mr. Walker's pamphlet. After describing the mode in which the gun-barrel tubes are formed, and especially the joints, he says,—

"The superiority of this method of making joints over any that could be applied to the large round or flat pipes, is the highest recommendation that Perkins's method could possibly possess over the others; since in that method alone can perfect security be found. When we consider the annoyance of an escape of water, the damage a handsome building may sustain by it, and the expense incurred in repairing such defects, its preeminent advantages must be strikingly obvious. And, if we suppose the possibility of an escape from

the small tubes, it is trifling, compared with that from the other kinds, the least capacious of which requires eight times the quantity of water, nearly the whole of which may leak out. Now, ten gallons will suffice in the small tubes for heating a tolerably large building; the escape of which would be quite immaterial compared with that of eighty gallons, which the larger pipes would require. But even the remotest probability of a leakage is so contrary to experience, as not to come within the question.

"The advantage of diminished weight possessed by flat tubes over round ones belongs, in a still greater degree, to the gun-barrel tubes. To do the work of one foot in length of flat pipe, three feet of small tube will be necessary at its increased temperature: both these quantities being filled with water, the latter will weigh about one third as much as the former. So insignificant, indeed, is the weight of Perkins's apparatus, that, practically, it never comes under consideration.

"The quantity of water contained by 3 ft. of this tube is about 16 cubic inches. The quantity previously stated as the contents of a foot of flat pipe is 96 cubic inches; whence a saving of five sixths in quantity of water. Hence this apparatus is much more at command, and more easily controlled and regulated, than the others; the small quantity of water being so easily and rapidly heated and cooled. As in the case of the flat pipes, this property has given rise to objection where horticultural buildings, and others requiring a high temperature to be prolonged without attendance, are concerned, it being always urged, that a large body of water is requisite to maintain the heat. But it is found, and has been demonstrated in numerous instances, and in very extensive ranges of glass-houses, that, notwithstanding the natural tendency of a small quantity of water at a high temperature to part rapidly with its caloric; still, by a proper arrangement of the furnace, or fireplace, a sufficiency of heating surface, and a tubular boiler of adequate dimensions, the temperature of 70° can be maintained for seven hours, during frost, with a loss of only 6°, which is amply sufficient for practical purposes.

"These tubes, when neatly and regularly fixed, are by no means a disfigurement in themselves, therefore do not frequently require concealment, and are so small, that, when painted of the same colour as the skirting or other material to which they are fixed, they pass almost unobserved. In highly ornamented buildings, where their concealment is indispensable, the extremely small space they occupy renders it so easy to disguise them behind skirtings or fixtures, as to make them capable of introduction in a vast number of buildings, and applicable to a variety of purposes, to which neither of the other plans could be possibly adapted. Numerous examples might be mentioned in this city alone, where those plans, by reason of their bulk, would have been utterly inadmissible; and to which the advantages of the hot-water principle would have been altogether lost, but for the extreme facility of introduction peculiar to this application of it. An immense field is thus opened for the advantageous adoption of that principle, and the complaints of disfigurement which the utmost ingenuity of many skilful architects and engineers could not prevent, are entirely obviated. I need not say more on this point than just mention, that 200 ft. of this tube, a quantity sufficient to heat an apartment 40 ft. long, 25 ft. wide, and 14 ft. high, can be concealed beneath a pedestal 3 ft. long, 1 ft. 6 in. wide, and 4 ft. high; while the equivalent quantity of flat pipe, viz.:—67 ft. would require a pedestal of the same height and width, and *twice* the length.

"Let us now proceed to notice the objections usually raised against Perkins's apparatus; for, to objection all inventions are open, at the dictation of interest, of prejudice, and, also, of the fair spirit of inquiry. The first is, that the pipes will be burst by internal pressure, the water not having full liberty to expand in them. Were the system liable to this objection, it certainly would render nugatory the benefit of security from leakage. In the few isolated cases of rupture that occurred at the first introduction of the invention, it has been clearly ascertained, either that the work had been im-

properly tampered with, or that the first principles of hydraulics had been neglected in its erection, through the inexperience of the parties employed. On the improved plans of arrangement, suggested by those accidents, and by further experience, such casualties now never occur. One cause of bursting was the deficiency of strength in the material, which was made of the same thickness as the common gas tube. They are now made double that thickness, or three sixteenths of an inch, the great strength of which, when the smallness of the bore (barely three fourths of an inch) is considered, must be apparent. They are proved by the manufacturer to a pressure of 2000 lb. per square inch, by means of a hydraulic force-pump.

"The idea of bursting being inseparably connected with that of danger (probably from the deplorable catastrophes that have resulted from the bursting of steam-boilers), I may here state, that, having been an eyewitness on two occasions to accidents of this nature, I should not have the least objection to stand within a foot of the rupture at the moment of its giving way. The report was small, and the escape of steam over in a few moments; after which, the only visible effect was the water trickling out from a fissure in the pipe, about 3 in. long and one eighth wide. The real mischief done was nothing compared with that of an ordinary leak on the other plans. The great strength of the material, the improvements in laying the pipes, and above all, the fact of these trifling accidents having been confined to the early stage of their introduction, place it, however, beyond the verge of human probability, that my courage will be put through the watery ordeal above stated. If the pipes be properly arranged, it is impossible.

"Casualties of this nature, proceeding from an improper arrangement of the tubes, are not confined to this plan. The other methods are equally liable to them, if first principles be not constantly kept in view. Two of these have come under my own observation, of one of which, a circumstantial account was published, about two years ago, in the *Mechanic's Magazine*, by Mr. W. Carmichael, of Lincoln's Inn, London, in whose house the accident occurred. This should be borne in mind in a comparative view such as the present.

"The next objection usually brought forward is, that the pipes will become furred up with the sediment of the water. When we consider the small quantity of water requisite for keeping up the supply to a large apparatus of this kind (about a quart in a week), it will be evident, that the weekly amount of sediment introduced will be very small. And, since the above supply is more than requisite for an apparatus containing ten gallons (which would not be used during the summer months), it follows that the original ten gallons would not be entirely consumed for at least a year. Now, a common tea-kettle, emptied and replenished, say once in a day, each charge of water leaving its own sediment behind, would not be furred up for at least twelve months, or 365 days. Consequently, the pipes being replenished only once a year, they would remain 365 years in good condition. But it appears probable that the sediment is not deposited at all; since the water flows through the gun-barrel tubes at the rate of 25 ft. per minute, which causes sufficient friction to keep the inner surface as it were washed, so that the sediment remains held in solution, or combination. This opinion is confirmed by the following experiment:—A socket was left loose, so as to allow of a small escape of water, which, on gaining access to the air at a high temperature, passed off in steam, leaving, in course of time, a white crust on the surface of the pipes; which would have remained on the inner surface, had it been previously separated from the water.

"Another argument urged against these tubes is, that they must soon be worn out by internal oxidation. The quantity of oxygen weekly taken in with so small a supply of water cannot be great; and, although water passed over a heated iron surface has a strong tendency to part with its oxygen, even this small quantity is found not to combine with the iron, under the pressure at which these pipes are worked. This and the last objection are best refuted by the following fact:—An apparatus for heating a large ginger-stove, in

London, was examined after being two years violently worked night and day; and, though the water used was that of the river Thames (not remarkable for its purity), the interior surface of the tube was found perfectly free from corrosion or sediment of any kind; so much so, that the original marks of the rollers used in the manufacture were distinctly visible.

"The last objection worthy of notice is, that the tubular boiler will soon be burnt through. How this form of boiler should be more likely to become so than any other, it is difficult to conceive. The pipes are as thick as large steam-boilers are usually made. The surface, it is true, is larger in proportion to its contents than in the usual forms; but it must be borne in mind, that the faster the heat is imbibed from the fire, the more rapidly does the water circulate; consequently, the faster is the cooled water poured back into the boiler. Numbers of these boilers have been in constant work for five years, without exhibiting the least appearance of detriment from this cause.

"The only question now remaining is, the comparative amount of fuel consumed respectively by the three kinds of apparatus. From what has been stated, it appears that, in all the other points in which the flat pipes are preferable to the round ones, the gun-barrel tubes possess a decided preeminence over either. When we consider that this method has, from its nature, the greatest of all advantages, that of perfect security from leakage, which in no degree belongs to either of the others on a large scale; that its weight is quite immaterial; that its small size renders it incapable of attracting observation, and perfectly easy of concealment; that it is more easily controlled and regulated, and more rapid in its effects; that its first cost is fully fifteen per cent. less, and that it saves more than this in carpenters' bills, and dilapidations; the question of fuel becomes quite a subordinate one. It is one on which great difference of opinion exists among those well acquainted with the subject, which arises, in great measure, from the difficulty of putting the different plans into fair competition. A calculation merely of the space heated will lead to a very uncertain result. (See *Tredgold on Warming and Ventilating*.) Different buildings, of the same size, are subject to very great differences of facility in heating: owing to their shape, their situation with regard to adjacent buildings, number and position of windows and doors, ventilation, drafts of air, number of occupants, and many other local causes. Again, the quantity of fuel consumed depends very much on the nature of the chimney which carries away the smoke; for I have sometimes found that a small apparatus has consumed more than a larger one, which can only be referable to this cause.

"The precise comparative consumption of fuel, therefore, can only be obtained when one of these methods shall be done away with in any given building, and another substituted at the same chimney. This has been done, with a result favourable to the gun-barrel tubes; though on so limited a scale as, perhaps, not to form a sufficient ground from which to draw general conclusions. But it appears to me to be quite a secondary consideration, which will not admit of being brought into competition with so numerous a catalogue of advantages as have been given, even though it should be adverse to the small tubes.

"That these tubes save considerably over the old method of stoves, has been satisfactorily tested, in many instances, by actual substitution; of which I shall merely furnish one, from an original document in my possession, giving the results of experiments tried on one of Perkins's apparatus in a large public institution at Londonderry, by the officers of the establishment; which shows that, though double the amount of space is now heated, the saving of fuel on a yearly consumption of 95*l.* is 35*l.* 9*s.* Future improvements may make this saving still greater."

Mr. Walker has not touched on the subject of ventilation in connexion with heating; a subject which, as Mr. Ritchie has

shown in Art. I. in the present Number, is almost totally overlooked by the heating engineers of the present day.

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ART. IV. *Third Letter from W. R. Hamilton, Esq., to the Earl of Elgin, on the Propriety of adopting the Greek Style of Architecture in Preference to the Gothic, in the Construction of the new Houses of Parliament.* Pamph. 8vo, pp. 58.

MR. HAMILTON has great merit in persevering in his recommendation of the Grecian style, which, we sincerely hope may ultimately be that adopted in the Houses of Parliament. We cannot bring ourselves to admire an irregular building, or one which has chiefly the picturesque or novelty to recommend it, for a public edifice. Let us have the simple and grand quadrangular masses of the Roman manner, which owe nothing to novelty, and, consequently, the approbation of which will have no relation to fashion. The duration of such a building, too, will be incomparably longer than that of any modification of the light and elegant Gothic, exposing, as it does, so much greater a surface to the action of the weather. We sincerely hope that Parliament will pause before they either rebuild the houses on the same site, or rebuild them in the Gothic manner.

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ART. V. *Domestic Clubs for the Working Classes.* By A. Freeman of Exeter. Folio Sheet. Price 1d. Limbird.

THIS sheet contains a proposal altogether after our own heart; and, if we had time and money at our command, we should devote both to aid in carrying it into execution. The principle which the author proposes to apply to the working classes might probably be applied with peculiar advantages to particular professions: for example, the architects of a great city like London might live together in one or two large club establishments; and we are certain that authors would benefit immensely by them. We formed a scheme of this kind nearly twenty years ago, of which some notice will be found in the *Mechanic's Magazine*, and also in our *Encyclopædia of Cottage Architecture*, p. 244. and 250., where the plan and elevation are given of an establishment of the same nature as that proposed in the sheet before us. We hope the paper will be duly brought into notice in the *Mechanic's Magazine*, and in all weekly newspapers. Some man of capital will doubtless soon be found who will carry such an establishment into execution merely as a commercial speculation.



ART. VI. *The Antiquities of Athens, and other Monuments of Greece, as measured and delineated by James Stuart, F.R.S., F.S.A., and Nicholas Revell, Painters and Architects.* Small 4to, 103 pages, 70 plates.

A VERY neatly got up work, but on which no price is marked. It contains the essence of the costly work of Stuart in a portable form, and will be a valuable companion to every young architect, who wishes to familiarise himself with Grecian proportions.

ART. VII. *The Churches of London: a History and Description of the Ecclesiastical Edifices of the Metropolis.* By G. Godwin, Jun., Associate of the Institute of British Architects; assisted by J. Britton, F.S.A., &c. Nos. 5. and 6. 8vo. 1s. each.

No. 5. contains two Views of St. Peter's in the Tower; and No 6. two Views of the Temple Church; all, as usual, exquisitely engraved, and neatly described. This work is so very cheap, that we are sure it must find its way into the library of most antiquaries, of many architects, and of all admirers of churches.

#### MISCELLANEOUS INTELLIGENCE.

ART. I. *Professional Precedents.* No. II. *Contract for building New Churches.*

<p><i>This Indenture made the</i>  <i>in the Year of our Lord One thousand eight hundred and</i>  <i>between</i>  <i>of</i>  <i>one Part, and</i>  <i>of</i>  <i>the County of</i>  <i>other Part.</i></p>	<p><i>Day of</i>  <i>in the County</i>  <i>of the</i>  <i>in</i>  <i>of the</i></p>
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WHEREAS His Majesty's Commissioners for building new Churches appointed under an Act of Parliament passed in the fifty-eighth year of the reign of His late Majesty King George the Third, have determined to erect a upon a certain piece or parcel of land situate at

And whereas the said has been appointed by the said commissioners the architect for the superintending the building the said , and contracting on the behalf of the said commissioners, as their agent or trustee, with any masons, bricklayers, carpenters, smiths, plasterers, and other persons, for the execution of the different branches of the work necessary for erecting and completing the said

And whereas the said hath prepared the necessary drawings for the same, and made a general spe-

cification of all the works to be done, and of the materials to be found and provided for that purpose, which specifications and drawings have been approved of by the said commissioners, and which specification refers to the said drawings :

And whereas the said  
is willing to contract with the said  
to execute all and every such parts of the said works as are particularised  
in the said general specification, or which appear from the aforesaid drawings,  
or which may be implied therefrom, or incidental thereto, under the head

at or for the price or sum of

to be paid as hereinafter is mentioned :

And whereas such parts of the said general specification as are comprised therein, under the head

are hereunto annexed, or hereunder written by way of schedule :

And whereas the said general specification, and the aforesaid drawings, and which are numbered one to including the said specification from one to inclusive, have been signed by the said and the other persons who have contracted to execute the remainder of the works specified in the said schedule, and the said general specification and drawings are intended to be deposited with the clerk of the works employed on the aforesaid building, for the use of all the parties contracting, who are to have reasonable access thereto :

And whereas by the regulations adopted by the said commissioners, the persons contracting with the architect appointed by the said commissioners to build any church or chapel, are respectively to receive from time to time, during the progress of the works by them respectively contracted to be executed, instalments upon account of the work then actually done and executed by them (such execution to be certified by the architect as hereinafter mentioned); and upon the completion of the works so contracted by them respectively to be executed as aforesaid (such completion also to be certified as hereinafter mentioned), are to receive the remainder of the monies due to them respectively upon their respective contracts :

And whereas it hath been agreed that the said \_\_\_\_\_ should secure the due performance of \_\_\_\_\_ said contract, according to the conditions herein contained, by \_\_\_\_\_ bond or obligation, in the penal sum of \_\_\_\_\_ and further, that the due performance thereof should also be secured by the respective bonds or obligation of two sureties each, in the sum of \_\_\_\_\_

NOW THEREFORE THIS INDENTURE WITNESSETH, that in consideration of the sum of  
hereinafter agreed to be paid in manner hereinafter mentioned, the said

doth hereby for \_\_\_\_\_ heirs, executors, and administrators,  
covenant, promise, and agree, to and with the said  
in manner following; (that is to say,) that \_\_\_\_\_ the said  
shall and will duly execute, perform, do, provide, and complete, all and singular the works and materials respectively described, specified, required, and set forth in the specification comprised in the schedule hereunto annexed, or hereunder written, and therein, or in the said drawings contained or referred to, or thereby implied, according to such specification, and the aforesaid drawings and general specification; and also according to the general instructions and such explanatory drawings as shall or may from time to time be provided by the said \_\_\_\_\_  
during the progress of the works hereby agreed to be done, and shall and will do, perform, and execute, and complete all the said works, with materials

of the best quality, and in the most workmanlike manner, to the satisfaction of the said architect, and in all respects comply with, and abide by, the true intent and meaning of the said specification, drawings, plans, and instructions, and of these presents: and further that in case the said shall at any time or times be of opinion that a sufficient number of workmen are not employed by the said in the execution and completion of the works hereby agreed to be done, then, and in every such case, it shall be lawful for the said by a written notice or notices under his hand, to be left with the said

or sureties, or at his or their usual place of abode\*, to require that the said

shall provide such an additional number of workmen as the said may think necessary and reasonable to be kept employed on the said works either permanently or for a limited period, as the said shall, by such, or any other written notice or notices, require; and in case the said

shall not, within seven days after any such notice or notices shall be so left as aforesaid, provide the additional workmen thereby required, and in all respects comply with the said notice, or shall at any time thereafter, in any respect, fail to comply with the said notice, then, and in every such case, it shall be lawful for the said

to provide such additional workmen, and to continue to employ them for such length of time, and generally in such manner, as shall have been required by him in and by such notice or notices as aforesaid, at such weekly or other payments or wages as the said

may think proper, which payment shall be paid and deducted out of the monies which may then remain due to the said by virtue of these presents; and that in case the said balance then due shall be insufficient to cover the said payments or wages, then the said

heirs, executors, or administrators, shall and will make good and pay the deficiency upon demand: and further that the said shall, during the progress of the works hereby contracted for, provide and keep one or more competent foreman or foremen to superintend the said works, and to remain constantly, during the hours of work, upon the site of the said intended building; and that if the said

shall at any time consider any one of the said foremen as in anywise incompetent, or as acting improperly, it shall, in every such case, be lawful for the said

to supersede him, and put another in his place, at such weekly payment as the said

may think proper, which payment shall be paid and deducted out of the monies which may be due to the said

by virtue of these presents: and further that the said the said

shall not (unless with the consent of the said

in writing) make any sub-contract or sub-contracts for the execution of the work hereby contracted for, or any part thereof, nor (unless with such consent) assign or underlet this contract: and further, that in case the said

shall become insolvent or be declared bankrupt, or shall, from any cause whatever, be prevented from or delayed in proceeding with or completing the said works, according to this present contract, or shall not proceed in the said works to the satisfaction of the said

or of the said commissioners, it shall be lawful to and for the said or the said commissioners, to give, or cause to be given, or left with or at the usual place of abode of the said

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\* Or with the foreman or principal workmen engaged on the works.

or sureties, a notice or notices in writing, for the said

to enter upon and to commence, and regularly proceed with the said works; and that in case the said

shall, for seven days after such notice given or left, make default in commencing or regularly proceeding with the said works, it shall and may be lawful to and for the said

or the said commissioners, to employ any other respectable workman or workmen, either by contract, or measure and value, or otherwise, to proceed with the said works, and to complete the same, and pay or cause to be paid to the said workman or workmen the amount of his or their charges for the same, and for all necessary materials to be found and provided for such completion, out of the money which shall be remaining due to the said

on account of this contract: and further, that the monies which previously to such default shall have been paid to the said

on account, in respect of any work or materials then already done, executed, or provided, by the said

shall be considered as the full value, and be taken by the said

in full payment and satisfaction, not only of and for the said work and materials, in respect of which such payment may have been made, but likewise of and for any other work and materials which the said

shall then have done, executed or provided, although no such payment may have been previously made in respect thereof: and further, that all the balance and monies whatsoever, which then or thereafter would have been or become due or payable to the said

under this present contract, if this present clause had not been inserted, together with all the materials then delivered for the purposes of the work hereby contracted for, and then being upon or about the site of the said building, shall, upon such default as aforesaid, become and be in all respects considered as the absolute property of the said commissioners: and further, that if the said balance, monies, and materials, so to become the property of the said commissioners as last aforesaid, shall be insufficient to cover such charges for workmen and materials, as are herein-before lastly directed to be paid thereout, then the said

heirs, executors, or administrators, shall and will make good and pay such deficiency upon demand: and further, that all materials brought and left upon the said land by the said

or by order, for the purpose of being used in or about carrying on the said works, shall, from the time of their being so brought, be considered as the property of and belonging to the said commissioners, and shall not, on any account or pretence whatsoever, be taken away by the said

executors or administrators, or any other person or persons whatsoever, without the special licence and consent of the said or of the said commissioners but neither the said commissioners nor the said

shall be in anywise answerable or liable for any loss or damage which may happen to or in respect of the said materials, either by the said materials being lost, stolen, or injured by weather, or otherwise howsoever: and further, that in case any of the said materials so brought by the said

shall be considered by the said or the clerk of the works, as unsound or improper, the said

shall and will, upon notice in writing to or foreman or foremen, given by the said

or clerk of the works, immediately cause the same to be removed from off the ground, and proceed with the said works with materials corresponding with the specifications and instructions herein-before mentioned, and to the satisfaction of the said

and that in default of such removal within three days \* after the said notice in writing †, it shall and may be lawful to and for the said

to cause the same to be removed to such place or places as he or they may think proper, without being in anywise answerable or accountable for any loss or damage that shall or may happen to such materials so removed, and to cause proper materials to be substituted for the same, and to pay all expenses attending such removal and substitution, out of the monies which may be due to the said

by virtue of these presents : and further, that in case the said should consider any part of the said works to be unsoundly or improperly executed, the said

shall cause the same to be immediately taken down and properly re-executed without any extra charge whatsoever : and further it is agreed by and between the said parties to these presents, that if the said commissioners shall think proper at any time to make any alterations, additions, or omissions, to or in the works hereby contracted for, they shall give to the said written instructions for such alterations, additions, or omissions, signed by the secretary of the said commissioners, but the said

shall not be considered as having authority for any alteration, addition, or omission, nor as entitled to make any claim for the value or otherwise in respect thereof, without such written instructions so signed as aforesaid : and further, that any such alteration, addition, or omission shall not vacate this present contract, but shall be ascertained by admeasurement or valuation in all respects according to the prices stated in the tender, which the said

has made in respect of the works hereby contracted for, and which tender is also set forth in the said schedule hereunto annexed or hereunder written ; and that the value thereof, so ascertained, shall be added to or deducted from the amount of this contract, as may be, and the addition in value (if any) paid for in the same manner, and at the same time, as is hereafter mentioned for the payment of the said sum of

hereby agreed to be the price of the works hereby contracted to be executed : and it is hereby further agreed, between and by the said parties to these presents, that the clerk of the works shall not set out any of the works, but shall furnish copies of the original drawings in his possession, for the use of the said

and the said

shall see that the said copies are correct, and any deviations made therein from the original drawing, except what are ordered by the said commissioners in writing as aforesaid, shall be altered and corrected at the expense of the said

And it is hereby further agreed, by and between the said parties to these presents, that any damage to the works, or to the materials or implements therein used, arising from accident, or from the carelessness of workmen or otherwise, shall be effectually made good by the contractor or contractors for the particular branch of the work in which the said damage shall happen, unless it be proved to be done by any particular workman or workmen in any other branch, in which case the contractor or contractors employing the said workman or workmen shall be accountable for the damage, of which the amount shall be determined by the said

but no charge whatever shall be brought upon the said

or upon the said commissioners, for making good the same : and further, that the said

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\* This is too long an interval, and allows an unprincipled contractor the opportunity of working up some of the bad materials, in spite of the vigilance of the most active clerk of the works : twenty-four hours should be the time allowed.

† Here the words " the same shall be considered as rubbish " should be introduced, in order to relieve the architect from all responsibility.

shall and will generally do, execute, and provide not only all the work and materials respectively expressed, described, and specified in the said specification hereunto annexed or hereunder written, but likewise all such works and materials as are necessarily implied, or may be reasonably inferred, in or from the said scheduled specification, or in and from the said general specification and drawings respectively, although the same may not happen to be therein expressly mentioned, as to be done by the said

the true intent and meaning of these presents, and of the said and

being: and it is hereby declared to be, that the work and materials hereby contracted to be done, executed, and provided shall include all that is requisite for the completion of the said so far as respects the said

work: and further, that if any dispute shall arise between the said and any of the other contractors for the other parts of the said works relative thereto, or to any other matter connected with the performance of the said works, every such dispute shall be referred to the said

whose decision shall be final: AND THIS INDENTURE FURTHER WITNESSETH, that in consideration of the premises, and of the covenants herein-before contained on the part of the said

to be performed, the said

doth hereby (as such agent or trustee on behalf of the said commissioners as aforesaid) agree with the said that he the said

shall be paid by the said commissioners the aforesaid sum of of lawful money of Great Britain, so agreed to be the price for the providing and execution of the said materials and works hereby contracted for, by the instalments, at the times, and in the manner following; (that is to say,)

When the said

shall have executed any considerable part of the work, hereby contracted to be done as aforesaid, and the said

shall have inspected the same, and ascertained that it is executed in strict conformity with these presents, and the drawings, specifications, and conditions herein referred to, then the amount or value of two thirds of the work so executed shall be paid, as hereinafter mentioned, to the said

and so from time to time in like manner until the whole of the said works shall be executed: and the balance of the said sum of

shall be paid within two months after the whole of the works of the said ch shall be so completed, and shall have been inspected and certified to

Her Majesty's said commissioners by the said

Provided, nevertheless, that the said

shall not be entitled to demand or receive any of the aforesaid instalments until the said works, on which the payments of the said instalments are respectively made to depend, shall have been completed to the satisfaction of the said

who, on notice being given to him by the said

for that purpose, shall examine the said works so from time to time to be executed by the said

and then (if the same shall be so completed) certify the same to the said commissioners, according to the form agreed on by the said commissioners; and thereupon the said

executors, administrators, or assigns, shall be entitled to receive from the said commissioners the amount of the instalment then due in respect of the work so certified to be done, such payments to be made in the Exchequer bills, placed at the disposal of the said commissioners by the act 58 Geo. III. c. 45., or in cash, at the option of the said commissioners; and it is hereby further agreed, that the decision of the said

with respect to the amount, state, and condition of the work actually executed, and also in respect to any and every question that may arise concerning the construction of this present contract, or the aforesaid drawings and specifications, or the execution of the works hereby contracted for, or any



matter or thing whatsoever relating to the same, shall be final and without appeal

Provided always, and it is hereby declared and agreed by and between the said parties to these presents, that if the said

or other the architect to be nominated as hereafter mentioned, shall happen to die, or shall be removed for any cause, at the discretion of the said commissioners, or shall decline or refuse to act, or become incapable of acting as such architect as aforesaid, before the said works shall be fully executed and completed, it shall and may be lawful for Her Majesty's said Commissioners for building new Churches to nominate another person as architect in the room of the said

or of such other architect so dying, being removed, or declining, refusing, or becoming incapable to act as aforesaid; and that such architect so to be nominated shall have the same powers and authorities, and be liable to the same agreements and obligations to all intents and purposes whatsoever, as are by these presents given or reserved to or entered into by, or are hereby intended or implied to be given to, or to be entered into by, the said

as such architect as aforesaid: and this contract on the part of the said

shall be completed by the said

under the direction and control of such newly appointed architect, in such and the same manner in all respects as if this contract had been made and entered into with the said newly appointed architect:

And the said

do hereby covenant and agree, that the whole of the said works shall be completed on or before the day of

in the year one thousand eight hundred and

And, lastly, the said

doth hereby covenant and agree with the said

that the said

shall and will, at all times from the date hereof, up to the completion of the works hereby agreed to be done, render unto the aforesaid Commissioners for building new Churches, or their secretary, a true and just account of all and whatsoever the timber and other materials whatsoever, on which any excise or custom duty shall have been paid, or is payable, and which shall be used in and about the works hereby agreed to be executed, together with the names of the vessels in which such articles shall have been imported, or from which they may have been landed, together with the excise duties or customs paid in respect of such materials; and shall and will certify and authenticate such accounts, in such manner as the said

or the said commissioners may require; and shall and will, during such time as aforesaid, do all such acts, matters, and things as may be required by the said

or the said commissioners, for the purpose of exhibiting to Her Majesty's Commissioners of the Treasury a true and just account of all articles used in and about the aforesaid buildings, on which any duties of excise or customs shall have been paid, to the end that the aforesaid commissioners of Her Majesty's Treasury may be enabled to ascertain the amount of the duties on such articles, to be remitted or repaid to the aforesaid Commissioners for building new Churches: and it is hereby declared, that until such account shall have been so rendered as aforesaid, and all matters and things in and about the premises which shall have been required by the said

or the said Commissioners for building new Churches, shall have been done and performed by the said

the said

shall not be entitled to receive the last instalment of the said sum of

herein-before agreed to be paid, after the completion of the said contract as

aforesaid; any thing herein-before contained to the contrary thereof in any-wise notwithstanding :

Provided, lastly, that this present contract shall not, nor shall any clause or thing herein contained, charge, affect, or subject, or be in anywise construed to charge, affect, or subject the said

heirs, executors, or administrators, with any action, suit, or process, whereby the person or persons, or real or personal estates, of the said

heirs, executors, or administrators, shall or may be in any manner made liable for the non-performance or breach of any of the covenants and agreements herein-before contained. In witness whereof, have hereunto set hand and seal the day and year above written.

Signed, sealed, and delivered  
by the said

in the presence of

The commissioners will not allow any sum on account of extra works, unless such works have been sanctioned by them previous to execution.

[The above contract, when folded up, to be indorsed as follows.]

NEW CH

AT

CONTRACT BETWEEN

FOR THE

WORKS IN THE NEW CH  
AND

ARCHITECT,

AMOUNT £

Dated

## ART. II. General Notices.

*INDIA Rubber Paint.* — A composition of India rubber and linseed oil has recently been used for coating over iron, instead of tar, gas-liquor, or common paint. From the elasticity of the India rubber, it is not liable to crack or scale off, and it promises to be of very great durability. A manufacturer in Edinburgh, who is covering the roof of his manufactory with sheet-iron plates dipped in this composition, has promised to send us details, which we hope to be able to give in next Number. The same manufacturer had previously used pitched paper as a roofing; but, though this forms a very durable covering, and one that requires no repairs, the insurance against fire, he informs us, is in his case so much increased by its use, that it comes to be as expensive as a roof of tile or slate. — *Cond.*

## ART. III. Domestic Notices.

### ENGLAND.

*THE Institute of British Architects* have had a valuable addition made to their library by their Honorary and Corresponding Member, M. Beuth, Privy Counsellor to the King of Prussia. It consists of a volume, in three parts, which

has been published under the superintendence of that gentleman, in continuation of the celebrated work entitled *Vorbilder für Fabrikanten und Handwerker*. This selection consists necessarily of a more mixed character than the former parts. There are twenty-four plates in outline, and six shaded, of specimens for armour, furniture, picture frames, goblets, vases, ceilings, and panels, principally in the style of the "revival" of the fifteenth and sixteenth centuries; and four sheets of doorways from ancient buildings, taken from Donaldson's work. One part consists of twenty-three plates of elegantly coloured designs for ceilings and paperhangings, of various degrees of embellished patterns; some of the sheets representing the very elementary parts of foliage of which the more complicated designs are composed. This volume maintains the high character of its predecessors, and proves the jealous anxiety with which the Prussian government seeks to instruct the artisans of the country in the elements of beauty of colouring and purity of design. We perceive that Schinkel, the government architect, has contributed much to the various objects delineated in this volume. The text consists of a very limited quantity of letterpress, printed in another volume of a smaller size. This is a most mistaken practice with the Germans; which, whether proceeding from a notion of convenience or economy, produces quite a contrary effect to either: for, when placed in a library, the plates and letterpress must be in distinct book-cases; and if one be lost or mislaid, it diminishes materially the value or use of the other. This work is the more interesting at the present period, in connexion with the School of Design established by our own government, which, we trust, will be conducted with all the liberality and efficiency which mark the Prussian schools: we hope that no paltry notion of mistaken economy will mar the effort now making to raise the intelligence and skill of our working classes; and we augur well from the appointment of Mr. Papworth as director, than whom there cannot be a more efficient master in every department of decorative design. — *M. J. B. A. London, June 1837.*

*Institution of Civil Engineers.* — The members of the above Institution held their anniversary meeting on Saturday last, at the London Coffee House, when the Telford medals were distributed to Mr. P. W. Barlow, for his paper and investigations on the best figure and construction of lock-gates; to Mr. Tempenny, for his description of Hull docks; to Mr. Borthwick, for his article on iron wharfs; and to Signor Albano (an Italian), for his description and drawings of a bridge lately erected in Italy. All the above papers are published in the Society's *Transactions*. The medals have on one side a fine bust of Telford, and on the reverse a well-executed view of the Menai Bridge. — *W. London, June 6. 1837.*

*Central School of Science*, for the instruction of young artisans after the hours of labour, at Sir Isaac Newton's house, St. Martin's Street, Leicester Square, under the superintendence of literary and scientific gentlemen. The object of this Institution is to provide for that portion of the population resident in the contiguous district the means of scientific instruction in those branches of knowledge which are directly connected with, and applicable to, their respective daily occupations; so that, whilst their ordinary hours of labour are employed in the practical or mechanical performance of their work, their hours of recreation may be occupied in obtaining, in the most agreeable manner, the theory, or true scientific principles, upon which their respective trades or employments are based. As this kind of social intercourse will afford suitable opportunities for cultivating and stimulating the better feelings of human nature, and of repressing and subduing the merely animal passions, it will thus become a powerful moral instrument in the elevation of character, and in fixing the habits of the future man, at that period when the bias of character is almost invariably formed for good or for evil: it is submitted as an object worthy the support of all who desire to see the rising generation grow up in habits of intelligent industry and moral rectitude, essential to their permanent welfare.

This object is proposed to be attained by a course of evening instruction in classes, under competent teachers ; and by a library for reference and circulation, and a collection of casts and models.

The school will be open from five until ten in the evening. Subscription, 4s. per quarter, payable in advance. — *M. J. B. A.*

*School of Design.* — It having been considered important that instruction should be afforded to those engaged in the preparation of designs for the various branches of the manufactures of this country, a grant was made during the last session of Parliament for the furtherance of this object ; and, under the sanction of the President of the Board of Trade, the School of Design has been established, in the rooms at Somerset House, lately occupied by the Royal Academy, for the purpose of teaching design, including light and shade, colour, modelling, perspective, &c. There is a Provisional Council of fourteen persons, and the director is J. B. Papworth, Esq.

Masters, under the general superintendence of Mr. Papworth, will be employed to afford instruction in the various branches above enumerated.

Lectures will also occasionally be given on the principal subjects connected with the ornamental art.

A large collection of drawings and casts for the use of the School has been provided.

Such persons as are desirous of attending, must apply to one of the council, or to the director.

The students, before admission, must have made some progress in drawing, and candidates are to be examined by the director, who is to report thereon to the council, by whom the students are to be admitted ; the director, however, is vested with a discretionary power of admitting, as probationers, such applicants as may be considered by him qualified, until the decision of the council be ascertained.

Each student is to be subject to reprimand from the director, and to expulsion by the council, on the representation of the director, or otherwise.

The students are to have admission to the different lectures gratis.

In case of misconduct, the director has power to suspend the attendance of the student, until the decision of the council is known.

The payments of the students are to be made monthly.

The hours for attendance to be daily, from ten to four.

A vacation of two months will be allowed.

The students are to find paper, chalk, &c. Each student is to pay 4s. per week, such sum to be paid in advance from the first of each month.

*Admitting the Public, free of Expense, to all Depositories of national Monuments and Exhibitions of Art in national Buildings.* — We have great pleasure in recording the following resolutions, which were passed at a public meeting at the Freemasons' Hall, Great Queen Street, London, May 29. 1837, Joseph Hume, Esq., M. P., in the chair.

1. That a frequent contemplation of works in the fine arts, of historical and literary monuments, and of objects of natural history, is eminently conducive to the instruction, refinement, and rational amusement of the people ; and that this meeting views with satisfaction the increased facilities lately given to the public to view the collections contained in the British Museum and National Gallery, whilst the decorous conduct of the people visiting those collections proves that they fully appreciate every opportunity of instructive recreation.

2. That a free and gratuitous access to every national building or establishment containing works of art, historical and literary monuments, and objects of natural history, is the undoubted right of the people of these kingdoms, at whose expense such buildings and such establishments have been constructed or maintained.

3. That the virtual exclusion of the public from the monuments in West-

minster Abbey and St. Paul's, erected at the cost and for the honour of the country, is a national reproach, while the exaction of admission fees is a violation of the people's rights, and prejudicial to the cause of education and civilisation.

4. That to open to the public, without charge, the exhibition of modern art in the National Gallery, a building erected at the public expense, would be attended with great advantages in the improvement of the national taste.

5. That an address to His Majesty and petitions to both Houses of Parliament be presented, embodying the above resolutions; and that a deputation consisting of . . . . . be appointed to wait upon His Majesty's Ministers, requesting their aid in the attainment of the objects of this meeting.— *George Foggo, Hon. Sec.*

KENT. *Tunbridge Wells.* — A magnificent Roman Catholic chapel is now being erected at Tunbridge Wells, from the designs of Mr. D. Burton. — *W. London, June 6. 1837.*

*The Manchester Architectural Society.* — We are much gratified to find that an Architectural Society has been established at Manchester; and we have no doubt the example will be followed, sooner or later, in all the principal towns in Great Britain. A copy of the rules has been sent us, by which it appears that the officers and members of the council are almost all architects, the president being Richard Lane, Esq.; but the rules very properly admit of the introduction of amateurs: and, in our opinion, on their introduction into architectural societies much of the architectural improvement of the country will depend: for what corporation of professional men ever yet improved their own profession? The rules appear very judicious, and they are preceded by an introductory address by Mr. Lane, an architect high in his profession, and much respected in Manchester.

#### ART. IV. *Biography of J. N. L. Durand, Architect.* From the French of Monsieur Rondelet.

J. N. L. DURAND was born at Paris, the 18th of September, 1760. He was the son of a poor shoemaker, in the Rue St. Etienne des Grès, and was destined, like San Gallo, to follow some manual employment. The first few years of his life passed peaceably away, under the humble roof of his father, up to the period when he was to be apprenticed. It was necessary to adopt some decided avocation, when a fortunate circumstance occurred to change the plans decided upon by his father. He was then working for a benevolent person, who was in easy circumstances, and who took great interest in him. This generous man, finding that absolute want of means was the sole cause of the young Durand not being sent to school, proposed to his father to defray his expenses. He accordingly went to Montaigne, which was at that time noted for the severity of its discipline. Naturally of a sensitive and mild disposition, our scholar, who was now fourteen years of age, had much to endure in the contrast between the indulgences of a domestic life and the severities of a school. His repugnance to the latter was so strong, that he soon quitted the school, though he did not relinquish his classical studies, which he cultivated with great success.

Young Durand had always manifested a decided taste for drawing. A sculptor, who had seen his numerous sketches, offered to his father to cultivate the talents which he had observed in him; and it was to him that he went upon leaving school. But the pencil and the chisel only served to discover to him the natural bent of his inclination. In his private exercises, his drawings were always architectural reminiscences, and his models designs for monuments. It is by no means improbable that the constant view of the works of the new church of Ste. Génévieve, then carrying on in full activity, might awaken in his mind the idea of a decided vocation.

To his mother alone he confided the nature of his clandestine occupations; and, being greatly in want of compasses to give regularity to his designs, she procured this useful instrument for him, at the cost of her little savings; and he carefully preserved it through life. His assiduity in this kind of work, being attended with more successful results than his efforts in sculpture, induced the same benevolent friend, who had formerly sent him to school, to introduce and recommend him to M. Penseron, architect, who received him as a pupil; and young Durand soon rendered himself very useful. His progress was so rapid, that, at the age of fifteen, he was himself able to open a small school for architectural drawing. A year after this he became draughtsman to M. Boullé, architect to the king, with a salary of fifty pounds per annum.

The loss of his father, which occurred at this period, rendered this piece of good fortune of double value: for he became his mother's sole support; and he now found himself in circumstances to fulfil his duty, and to testify his gratitude to his parent. The genius of our artist had an opportunity of developing itself in the study of the numerous designs which M. Boullé was employed to make for foreign courts. Not considering that M. Durand's talents were sufficiently remunerated, M. Boullé several times proposed to raise his salary; but he would never consent to this proposition. Anxious that this disinterested conduct should not be prejudicial to him, M. Boullé settled upon him an annual salary, which he enjoyed till his death; an act equally honourable to both parties. It was during the time he was with this master, who was as clever as he was generous, that our young artist contracted a friendship with the late Thibaud, his fellow labourer, which shed its happy influence over his life.

Without interfering with his occupations at M. Boullé's (indeed, most probably with his concurrence), M. Durand took part in the competitions of the Academy of Architecture. The only design of his, which remains at this school (then so brilliant), is the design for a college, adapted to a plot of ground in the form of an equilateral triangle, for which he obtained the second great prize in 1780.

From that period to 1793, M. Durand does not appear to have executed any architectural monument; for under this head we can scarcely rank the numerous designs which he made for the different collections of the monuments of Paris, which are, however, executed with an unusual degree of taste and feeling.

During this interval (in 1790) he was married to Mlle. Généviève Prudence Desforges, which proved to be a very happy union.

The various competitions, which the National Convention successively opened in 1793, for the construction of different public edifices, for utility and embellishment in various parts of France, afforded to M. Durand and M. Thibaud the opportunity of placing their names in an honourable position amongst those of the first French architects. Before them, Perrault, Servandoni, and Soufflot, were rendered illustrious by these means; and it is to this system that France owes its finest works in the arts, and from it her artists derive their highest title to glory. Notwithstanding the extreme shortness of time allowed for fulfilling the conditions of each programme, our architects (M. Durand and M. Thibaut) exhibited eleven designs, with this remarkable devise appended to each, which expressed at once the elevation and accordance of their sentiments, and which always formed the rule of their conduct. "Next to the happiness of being useful to one's country is the happiness of living unknown." Their compositions attracted general attention, as much by the talent as by the novel and bold style which they had adopted. The jury awarded the prizes to four of the different programmes; and all the designs were placed among the classical works. The public *fête* given at the French Pantheon, a short time after this competition, was the only undertaking entrusted to our architects by the government of that period: after



that they ceased to make designs together; but their friendship remained unabated.

We can only cite one house in Paris which was built by M. Durand: it was erected in 1788, in the Rue du Faubourg Poissonnière, and is known by the name of Maison Latuile. In fact, a cessation from active practice, in consequence of long study, purely theoretical, is not without example in architecture; for it is not with this art as with painting and sculpture, where the artist conceives, creates, and himself puts the finishing touch to his work. An architect, on the contrary, is not employed to execute buildings, without a severe competition and great exertions in forming a connexion and procuring patronage. It is, doubtless, to this humiliating conviction, of which he became conscious too late, that we must attribute the species of retirement which M. Durand adopted. A career more consonant with his inclinations, that of a professorship, was about to open upon our talented architect. The Central School for Public Works, since called the Polytechnic School, had just been founded. He was selected, with several of his contemporaries, as worthy to prepare materials for the architectural course of lectures, and was at length nominated to take the professor's chair.

The progress, which instruction had just made in every branch of knowledge, rendered his task extremely laborious. It is well known, that, rich as was this art in productions of all kinds, there existed no distinct rules by which it could be studied methodically. The limited time assigned to the course of architecture was an insurmountable obstacle to its full development. In fact, the period for general instruction in this school is but two years; and of this period the course of architecture only comprehends about fifty days. It is in the second year that this course takes place, and consists of thirty lessons, and eight competitions; and it was necessary, under such restrictions, to give the pupils an idea, however cursory, of the elements of architecture, and the laws or mechanism of composition. The merit of Durand's work, entitled *Précis de ses Leçons à l'Ecole Polytechnique*, cannot be duly appreciated by those who are not aware of the restrictions to which he was subject. *Le Recueil et Parallèle des E'difices de tous Genres*, which he had previously published, with the design of giving a greater range to his lessons, by adding example to precept, was received, on all sides, with unlimited approbation. This important work, so much wanted in architecture, served to establish his reputation and to render it immortal.

Independently of his lectures at the Polytechnic School, M. Durand had numerous private pupils, many of whom, at this time, hold a distinguished rank in the profession, either for their academic success or for the important works erected by them. M. Durand at length received the reward due to his talents, and the eminent services which he had rendered architecture. On the 5th of July, 1820, he received the decoration of the Cross of the Legion of Honour. Several foreign academies had previously elected him a member of their bodies; and this disinterested compliment in some measure consoled him for the indifference which he experienced in his own country. In the fortieth year of his professorship, M. Durand terminated his brilliant career, at the advanced age of seventy-four, on the 31st of December, 1834, at Thiais, in the neighbourhood of Paris.

#### ART. V. Retrospective Criticism.

COMBE'S *Lectures on Popular Education* (p. 260.). — In p. 260. your notice of this work speaks in high praise of an article in the Appendix, by John Robison, Esq., on an "improved method of teaching drawing." Referring to the "cubical box" mentioned, you express a wish that I would get up such an instrument for sale with my arithmetical models. It would be quite useless, without previously inculcating, or, at least, accompanying it with, the

natural theory and practical rules of *Perspective Rectified*, of which I am the author. The evidence of the sense of sight is delusive in the extreme, without the knowledge of the cause, relation, and effect of the modifications of vision. The blind boy, couched by Chiselden, on gaining sight, found the touch and the sight to offer such contrary evidence to his mind, that he asked which was the lying faculty, seeing or feeling. "The art of looking at objects, and of recognising what we really see," was unknown till I introduced the natural doctrines; which science, up to this time, refuses publicly to acknowledge, although the unavoidable adoption of them is creeping into popular teaching. That my bare assertion of "what we really see" having been unknown may not be taken implicitly, first, let a review be made of all the works of art in the world, wherein the perpendicular edges of buildings have been represented, purporting to be *as seen*: have they not been drawn invariably perpendicularly of their geometrical length, and their parallelism preserved, although their positions be "more and more oblique" to the vision, as the "common pencil" will be when moved as directed by Mr. Robison? Next, review the old systems of perspective. A higher authority cannot be cited than the learned and renowned Dr. Brook Taylor, whose theory of delineating "what we see" has been the text of all writers for the last century. By his system, the "cubical box" would be represented with one side a perfect square (one of the sides being parallel to his face) from every part of the "upright rod or stand in the proposed model;" and, when so placed that the eye embraces either the top or the bottom of the box, his system converges the sides of them only; the delineation presenting a square combined with a trapezoid, as the representation of the cube from an elevated or depressed position. This cannot be the natural modification of the eye, unless the horizontal surface of the cube works on a hinge. This mathematical error I have before exposed in this Magazine (Vol. III. p. 422.); and in the same article appears a woodcut of the perspectronometer, an instrument to explain the *apparent* lengths of lines, viewed in every position. This instrument answers all Mr. Robison proposes in placing the pencil in various inclinations before pupils. Instead of the "cubical box," moving on an upright rod, being submitted to the eye without any association, my models of the cube are submitted to my pupils with the rays (represented by threads) meeting at a defined point of distance, and within those rays (lying in its true and only plane) the forms of the appearances actually seen from those points. Unless these images form a prominent feature in the models, and the principles of their formation be clearly explained and understood by the pupil, little improvement in the system of teaching drawing as a "useful art" can be expected; moreover, the knowledge of what we really see cannot be fully comprehended without these conjoint means; for diagrams on a plane surface do not sufficiently convey the convergence of rays from all the parts of a solid body.

With the exception of Mr. Robison's disregard of the mechanical use of the pencil, his observations, extended by me to all the ramifications of drawing, are to be found in my *Art of Miniature-painting*, published January, 1831; and in my treatise entitled *Perspective Rectified*, published March, 1836. As a practical teacher, I have found that the mechanical use of the pencil is indispensable to display our mental knowledge; and Mr. Phillips, in his lecture at the Royal Academy, a few years since, seriously called on the students to cultivate their manual skill, declaring he found their mental improvement far beyond their power of handling. For many years, it has been my devoted object not only to improve, but to establish a mature and undeviating standard of instruction. Although a trifling portion of my theory is considered to be "beyond all praise" in coming from Mr. Robison, yet learned individuals and societies refuse to answer my letters, or to tolerate the principles and practice of a science that cannot be controverted. I have been insulted in the midst of the members of the Architectural Society for expounding this very doctrine; and, in the report of the January monthly meeting in the *Morning Herald*, it

is said, "they know in what class to place such bold paradox-makers," &c.; although the principles were scientifically displayed, and the "cubical box, with its rays and appearance," in a model, stood in the midst of the learned members. There is but one natural system of delineating the objects of nature. I have studied the forms of nature in the abstract, and their natural associations with vision: geometry teaches the first, and rectified perspective teaches the latter. Drawing, taught by my original system, becomes an useful and instructive art. The knowledge of the theory is essential and indispensable to the philosopher and connoisseur as a standard of taste. In conclusion, permit me to ask why I am denied the merit due to me, and wherefore science will not recognise and tolerate in me what ultimately must become the universal doctrine of vision, and the only perfect system of delineation? — *Arthur Parsey. No. 23. Piccadilly, May, 1837.*

*Bursting of a Hot-Water Apparatus, &c.* — In p. 267. there is a communication from Mr. Mallett, referring to a hot-water apparatus, fixed by Turner and Walker, at Lord Harborton's. I cannot admit that the accident which happened to that apparatus in any degree bears out the theoretic anticipations of Censor. That a longitudinal fissure, of about 2 in. in length, was opened, is quite true; that it was caused by "sheer heat and pressure" cannot be doubted; but how this "clearly proves" that it is impossible, on Perkins's system, to preserve a safe proportion between the receiving and dispensing surfaces, I cannot conjecture.

That the fissure, in this case, was not caused by too large a quantity of receiving surface, will appear from the fact, that, during the two years and a half which have elapsed since this apparatus was erected (and for a considerable time previously), the proportion of surface receiving heat, adopted in this instance, has been the one continually used in hundreds of instances, both by ourselves and others in the trade. Why, then, do they not all burst, being all worked at the same pressure? The real cause may be traced, with much greater probability, to the circumstance (as mentioned to me by Lord Harborton) of this apparatus not having been replenished with water for a period of six weeks (instead of once a week, as directed by us), whereby the water was so much reduced as to stop the circulation, when, of course, the heat was accumulated in the boiler or fire-coil; whence the undue pressure on that part. That this is the true solution of the matter, is confirmed by the fact of the pipes not having worked well for a day or two previously.

It may be proper to state, that the pipes now manufactured for this invention are of a much stronger description than was made at the time this apparatus was erected. Had such been then in use, it is probable the fissure would not have taken place.

Under similar circumstances of inattention, and consequent want of water, I fully believe, from past experience, that similar consequences, from a circulation accidentally impeded, would have resulted to any apparatus on the open, or low-pressure, system. Such an accident happened to a pedestal apparatus at the Patent Office, Lincoln's Inn Fields, London, which was taken down and replaced by one of Mr. Perkins's. — *W. Walker (of the Firm of Turner and Walker), Hammersmith Works, Ball's Bridge, Dublin. May 19. 1837.*

## ART. VI. *Institute of British Architects.*

APRIL 17. 1837. — J. B. Papworth, V.P., in the chair.

*Presented.* The Antiquities of Sefton Church, near Liverpool, by R. Bridgens, folio, 1822. Observations addressed to those interested in either Railways or Turnpike Roads, by A. Gordon, C.E., pamph. 8vo, 1837. Essay on Heraldry, and its Connexion with Gothic Architecture, by W. L. Donaldson, Hon. Sec. I.B.A., pamph. 8vo, 1837. The Churches of London,

by G. Godwin, Jun., No. iv. An Appeal to the Public on the Subject of Railways, by G. Godwin, Jun., pamph. 8vo. Specimen of red Marble from New Haven, in the Peak, Derbyshire. Three Prints of the proposed Improvements at the Spa, Scarborough.

*The following Letter, addressed to the Secretary, was read:—*

“British Museum, April 12. 1837.

“Sir,—Having laid before the Trustees your letter of the 25th Jan. last, addressed to Sir H. Ellis, I am directed to transmit to you, for the use of the Institute of British Architects, a copy, in large paper, of the several volumes published by the Trustees, in Illustrations of the ancient Marbles and Terra Cottas preserved in the Museum.

“The Trustees desire me to add that they have very great satisfaction in making this contribution to the library of the Institute, and endeavouring to promote the objects for which His Majesty has been pleased to grant the Institute a charter of incorporation. I am also to beg that you will offer the especial thanks of the Trustees to the Council, for the donation of part i. vol. i. of the *Transactions of the Institute*.

“I have the honour to be, &c.,

“T. L. Donaldson, Esq.”

“J. Forshall, Sec.”

The books are:—A Description of the Collection of the Ancient Terra Cottas in the British Museum, with engravings: 4to. London, 1810. A Description of the Collection of Ancient Marbles in the British Museum, part i.: 4to, 1812. Part ii., 1815. Part iii., Townley Marbles, 1818. Part iv., Bas Reliefs from the Temple of Apollo Epicurus. Part v., Sepulchral Monuments. Part vi., Pediment of the Parthenon. Part vii., Metopes of the same.

*Papers Read.* On the Authenticity of Vitruvius, as the Author of the ten Books of Architecture ascribed to him from the German of Schultz. A Description of the recent Discoveries made on excavating the Ground, on which anciently stood the principal Buildings of the ancient Abbey of St. Mary, near the Walls of York, by P. F. Robinson, V.P.

T. L. Donaldson, Hon. Sec., offered some observations upon the different styles of Pelasgic or Cyclopean constructions existing in Greece.

May 1. 1837.—At the Annual General Meeting held this day, the same officers were elected as last year.

The Marquess of Northampton, and the Rev. R. M. Pemberton, of Church Stretton, Shropshire, were elected Honorary Fellows.

*The following Report of the Council was read:—*

“If on former occasions the Council had satisfaction in rendering an account of their proceedings for the past year, they have at this meeting a peculiar gratification in contemplating the distinguished success which has attended the Institute during the last twelve months. The members are already aware that His Majesty having graciously granted a charter of incorporation, the Council had anticipated the most favourable consequences from this circumstance. But they had little foreseen that, in becoming a body corporate, the Institute would have derived such immediate fruits from this important station among the scientific bodies of the empire. The Royal Societies of London and Edinburgh, the Royal Society of Literature, and Royal Geographical Society, as also the Institution of Civil Engineers, have interchanged transactions with us. The Council, relying on the liberal spirit which actuates the Society of Antiquaries in their promotion of all subjects connected with archeological research, applied to that body for copies of the works which they had published. This application was liberally met by that Society, and in consequence our library has been enriched by the addition of fourteen volumes of the *Archeologia*, and the series of Carter's *Illustrations of the Cathedrals*, &c. Similar success has attended a like request to the Trustees of the British Museum, who have in the most gratifying manner presented to the Institute large paper copies of the seven valuable volumes

published by them upon the terra cottas and marbles of the national collection: Three of these volumes are highly interesting to the Institute, being illustrations of the sculptures of the Parthenon, and of the Temple of Apollo Epicurus at Bassæ, near Phigalia, and may be claimed as peculiarly belonging to Architecture. This series is very valuable as a work of reference to the architectural student, who may here contemplate the splendour which must ever result from the union of the finest productions of these two branches of art.

"Another event of great importance, which has marked the past year, is the publication of the first part of the first volume of our Transactions. This has been prepared and published, less as an evidence of the active zeal of the Institute in carrying out the purposes for which it was founded, than to prove to all interested in the art the use that would be made of the contributions received from their correspondents. Within six weeks from the first appearance of this part a second edition was required and has been published, and the various periodical publications have, almost without exception, noticed the Transactions as a production creditable to the Institute.

"The Council have been enabled also to engage the talents of able professors to lecture upon the departments of botany and geology more immediately connected with architecture. Accordingly series of lectures have been delivered by Dr. Dickson, upon the physiology, structure, and properties of woods used in construction, and by Mr. Wilton Turner upon geology, which the Council hope have not been without advantage to many of the members. It has been matter of regret that the lectures did not command a larger number of auditors. This mode of conveying instruction in practical architecture, and the new branch of knowledge now first brought to bear upon construction, is somewhat a novelty in the profession; but it is to be hoped that a more familiar acquaintance with the importance of such pursuits, and the great use to which they may be applied practically, will insure a more numerous attendance on future occasions.

"The Council are in communication with an able chemist, who will during the next session consider chemistry in reference to construction, and by a series of lectures draw the attention of members to those laws, in that department of science, which govern the various substances used in buildings.

"The subjects proposed for prize essays last year not having proved successful, it is to be hoped that they will, at some future opportunity, be productive of happier results; when those who study architecture may be better prepared to view such researches in a manner commensurate with their importance and influence upon the progress of the art, as has been the case in Germany, where of late years many disquisitions have appeared on these branches of investigation. The Council trust that the variety, novelty, and interest of the subjects recently proposed for the medals may elicit considerable information, and produce valuable additions to the standard works which now form the library of the architect. In the literature of architecture little has hitherto been done, except to develop those principles which guided in each particular style the architects of Egypt, Greece, Rome, and the middle ages, in their admirable edifices: the mind, however, being fettered too often, in such works, with a somewhat restricted limitation to each particular class; it is desirable that a more enlarged view should be taken of the subject, and that the architect may be excited to think for himself, to seek for new impressions from new sources, be thrown more immediately upon the resources of his own mind, and thus avoid a mere slavish imitation of established precedents.

"The correspondence of the Institute has been greatly extended during the past year; and letters from the Rajah of Tanjore, as also from architects in America, encourage us to expect communications from those countries at once new and instructive. Our relations with Germany have also been increased; and the Institute have seen with satisfaction their Honorary and Corresponding Members not only contributing useful information, but also some of them, as Messrs. Klenze and Ottmer, coming amongst us and being received

with the cordiality and respect due to their distinguished reputation. It has always been a subject of hope that the formation of this Institute might give an impulse and movement to architecture throughout the world. It was therefore highly gratifying to the Council to learn from their Honorary and Corresponding Member, Mr. Town of New York, that the architects of America, influenced by the example of their English brethren in art, had taken steps to found an Institute of Architecture, with branch societies in four of the principal cities of the United States.

"The Council cannot allude but in terms of deep regret and sincere respect to the loss which the Institute has sustained in the death of its early benefactor, Sir John Soane. A deputation had the melancholy satisfaction of paying the last tribute of respect in following to the tomb the remains of their venerable professor; and it is to be hoped that the profession may derive from the Soane Collection all those advantages which its founder had fondly hoped would result from his bequest to the nation. There are few architects whose career has been marked with more severe animadversion, and at the same time more honourable testimonials of respect, than the late Sir John Soane. It is to be desired that, as the peculiar eccentricities into which his taste wandered are too obvious to mislead the rising generation, greater justice may henceforth be done to those services which he has really rendered to the art, and to those points of excellence which distinguish many of his productions.

"The decease of Lord Kingsborough, within a few weeks after his election as an Honorary Member, has caused another loss to the Institute. This gifted nobleman, stimulated by an honourable desire to illustrate the antiquities of Mexico, incurred a very large expense in a publication, from the sale of which he could not anticipate any adequate return. It must be matter of satisfactory reflection to the members, that they have been able to confer this mark of their respect, so justly merited, and which, they are assured, was highly gratifying to the feelings of him who closed an early and active career in the promotion of art and science.

"Since the last Annual General Meeting the Institute has received an accession of six Fellows, six Honorary Fellows, and nine Associates, many of them practising in distant parts of the country. There has been an addition of seven Honorary and Corresponding Members. It has been with great satisfaction that the Institute have elected three Members of the Royal Academy as Honorary Fellows. Conscious that an Institution such as this, founded for the special purpose of promoting the best interests of architecture, and diffusing its principles as widely as possible, was justified in expecting the cordial cooperation of every member of the profession, the Institute felt that it was due to the peculiar position of the architects, then Members of the Royal Academy, to receive them into the body of the Institute in the class of Honorary Fellows. A special modification of the rules and regulations was made to that effect, and accordingly Sir R. Smirke, Sir J. Wyattville, and Mr. Cockerell have joined the Institute in this class.

"There have been added to the library and collection, 170 volumes, 50 prints, 50 varieties of woods, 300 specimens of stones and marbles: a pedestal of Devonshire marble, which is an evidence of the beauty of our native productions, has been presented by Mr. Fowler, the Honorary Secretary, and has been appropriately surmounted by a bust of his Majesty, the gift of G. Rennie, Esq., the sculptor.\* The extent of these acquisitions, and the numerous attendance of members and visitors at the ordinary meetings, have forcibly proved the necessity of finding more convenient and spacious

\* \* The variety and number of these accessions have rendered it necessary that a catalogue should be prepared of the books, prints, models, casts, marbles, drawings, and other objects which have accumulated. As soon as the session is closed, such a work will be commenced, and published during the vacation.



accommodation for the Institute. The Council feel more and more impressed with the just claim which a society, constituted as the Institute of British Architects, has upon the assistance of Government, for a suitable locality in which to hold its meetings, and to deposit that valuable collection which must eventually become of great use to all connected with architecture. The rent of appropriate apartments, in a central and eligible part of the town, is so heavy as to cripple and limit the extent of the usefulness to which the exertions of the members might be carried. The Council, therefore, confidently hope that His Majesty's Ministers will grant them rooms in some public establishment. In the mean time, it is necessary to provide for our accommodation, and the Council are looking out for apartments in some convenient situation.

"A balance sheet of the receipts and disbursements of the past year accompanies this Report.

"Among the contributions to the funds, the Council cannot but call attention to the honourable and liberal spirit which has actuated those of their members who, being exhibitors of designs for the new Parliament Houses, transferred their shares of the proceeds to the Institute, making an aggregate sum of 97*l.* 10*s.*

"The expenses, also, of the charter have been rendered less onerous upon the general funds by the contributions of 114*l.* by members, independent of part of the sum of 97*l.* 10*s.* previously mentioned; thus leaving only 72*l.* 17*s.* 6*d.* to be provided out of the general funds. The Honorary Solicitor declined making the usual professional charges for his time and attendances: it is proposed to present to him a piece of plate, which has been prepared for the purpose, in acknowledgment of his efficient and gratuitous services on this and all other occasions.

"The Council cannot but be conscious, in common with all the members, of the respectability, character, and importance which have attached to the Institute from the happy choice made in the first President. Under the original constitution the election of the same president was restricted to two years, and it is not in contemplation to recommend any alteration in that rule; but a new existence now commences under the charter, and the old regulations are no longer in force. The Council, therefore, beg to suggest, that it would insure the present state of prosperity and confirm the usefulness of the Institute, if, in accordance with the terms of the charter, His Lordship could be prevailed upon to continue to hold that distinguished station among us, in which he has already rendered such essential service by his active exertions and cooperation, and in which he has won to himself the gratitude, respect, and esteem of the whole body, by his condescension and kindness to every individual member.

"The Council, in rendering this account of the state of the property and affairs of the Institute, and in taking this brief review of its proceedings since their appointment, trust that they have fulfilled the duties which have devolved upon them to the satisfaction of the members. They cannot, however, but observe, in conclusion, that, great as may be the zeal which may actuate a council, at any period, in promoting the welfare and success of the Institute, the usefulness of this Society cannot be carried to its full extent, but must fall short of the just expectations of its efficiency and utility entertained by all classes and in all countries, unless the members in general exert themselves individually in contributing matters of information and instruction for the consideration of the ordinary meetings. They should constantly have their attention directed to the purposes of the Institute, and eagerly seize every opportunity that may arise in their own experience, or which may offer from other sources, of bringing before the notice of the Society all matters interesting either from their novelty or importance. In adverting to the papers which have been contributed during the past session, it must be noticed, with regret, that only a small portion have been derived from the Fellows. The communications have been chiefly from the Honorary Members, the

Associates, and from the Council, whose exertions as such might well excuse them from other contributions than those which necessarily arise from their official duties. It is earnestly recommended to the members generally, that they should exert themselves to avoid any deficiencies of this kind, which might prove injurious to the character and prosperity of the Institute."

May 15. — J. B. Papworth, V.P., in the chair.

*Elected.* M. G. A. Blouet, architect, of Paris, author of the *Restoration of the Baths of Caracalla*, &c., as Honorary and Corresponding Member.

*Presented.* Print of a Portrait of Mr. T. Tredgold. Print of the Tilers' and Bricklayers' Almshouses at Ball's Pond, Islington. Architectural Antiquities of Norfolk, by J. T. Cotman. Mazoi's Pompeii, part iii. Prints of Buildings designed and executed by W. F. Pococke. A Letter on the Subject of widening the Poultry, by S. Angell. A Cast from a Model of the Greek Obelisk at Karnack, executed in slate, under the direction of I. Bonomi, for Lord Prudhoe. 11 specimens of Baliscombe Marbles, from the marble works of Mr. Woodley, at Marychurch, near Torquay. Second Annual Report of the Poor Law Commissioners for England and Wales. The Churches of London, No. v.

*Read.* A paper on the recent Topographical Discoveries in the Roman Forum, by the Rev. R. Burgess.

*Exhibition of Bruce's Architectural Drawings.* Major Cumming Bruce, M.P., exhibited a series of views of the Roman antiquities in the ancient provinces of Rome in Northern Africa, taken by Bruce, the traveller, with the plans, elevations, and sections, drawn to a scale; and prefaced them with a paper, showing the means by which Bruce was enabled to penetrate into the country, and sketch the ruins of these buildings.

May 29. — P. F. Robinson, V. P., in the chair.

*Elected.* H. Roberts, architect, as Fellow; J. Blore, architect, and J. W. Wyld, as Associates.

*Presented.* W. R. Hamilton's third Letter to the Earl of Elgin on the new Houses of Parliament. Elements of Architectural Criticism, by J. Gwilt: 8vo. Interior View of the Senate House, Cambridge. 12 copies of a Memoir on Bruce's Journeys, by Major Cummin Bruce, M.P. Print of the De Dustanville memorial in Cornwall. Four volumes of original Drawings by the late G. Dance, Esq., R. A., architect.

M. Hittorff exhibited a series of Drawings illustrative of his restoration of the Temple of Empedocles, according to the polychromic system; and the translation of a paper, by M. Hittorff, on this subject was read.

June 12. — M. F. Robinson, V.P., in the chair.

*Presented.* Journal of the Royal Geological Society, vol. ii., and vol. vii. part 1. Barlow on the Strength of Materials, and on Construction: 8vo. Account of the Almshouses at Ball's Pond, Islington. The Manor House and Church at Great Chatfield, Wiltshire, illustrated by T. L. Walker: 4to. White on Cementitious Architecture. Rapport présenté au Conseil Municipal de la Ville de Paris: 4to. Lithographs of Pococke's Designs for the new Houses of Parliament. Temples, Ancient and Modern, by W. Bardwell: 8vo. The Churches of London, No. 6. Pamphlets, and two specimens of Lava, enameled, from M. Hittorff. Specimens of Tile, from F. Lush.

*Read.* A paper, descriptive of the Construction of the Roof of King's College Chapel, Cambridge, from the drawings, observations, and measurements of W. C. Milne, Fellow. An Essay on the Proportions and Embellishments of the Jewish Columns, called Jochin and Boaz, as described in the Holy Scriptures, by P. Leigh, Esq., Fellow. A Paper on the original Architecture, subsequent Alterations, and recent Restorations of the Chancel of the Church of Stratford upon Avon, by J. Britton, Esq., Honorary Member. A Letter from Mr. E. Carter, 66, York Road, describing his invention of a Valve for Gas-pipes.